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SUMMARY OF RECENT ABSTRACTS*

V. LEISHMANIASIS†

Visceral

In Georgia, U.S.S.R., Maruashvili (p. 285) has observed that visceral leishmaniasis occurs for the most part up to 1240 metres above sea level, and *Phlebotomus chinensis* and *P. kandelakii* are found and should be considered as vectors. In the western part *P. caucasicus* is found and should be regarded as the vector of cutaneous leishmaniasis. Pappataci fever, and *P. papatasi*, are found in the area of cutaneous leishmaniasis.

Manson-Bahr (p. 928) mentions a focus of kala azar in Kenya. He has been able, by inoculating cultures of leptomonads of *Leishmania donovani* into the human skin, to produce leishmaniomata and later a typical attack of the disease. Cultures of a gerbil and a ground squirrel strain gave similar nodules but not general disease. He thinks that many infections in East Africa are confined to the primary lesion in the skin. Patients recovered from artificially produced skin lesions, or from treated natural infections, were found to be immune to further inoculations, and it seems that active immunization may be possible in this way. Pentostam was the best drug for treatment. Heisch *et al.* (p. 1118) have found leishmaniae in gerbils in Kenya, which are morphologically similar to *L. donovani* and are infective to hamsters. They cause localized nodules on inoculation into the skin of man, without involvement of the viscera, and provoke immunity to *L. donovani*.

Wu (p. 426) reports on kala azar in China, where a form resembling the Mediterranean type is found in children in the north-west, and a form resembling the Indian type is found in older persons in the east. *P. chinensis* is the important vector, though several other species have been found. The range of flight of *P. chinensis* is very limited, and it has shown a preference for donkeys and cattle. DDT and BHC are highly effective against it.

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1959, v. 56. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

† For previous articles on leishmaniasis in this series, see the June issues of the *Tropical Diseases Bulletin* each year since 1939.

DEANE and DEANE (p. 23), in an endemic area of visceral leishmaniasis in Brazil, found the vector (*Phlebotomus longipalpis*) in houses and animal shelters, and also in outdoor resting places. The typical breeding place is yet to be discovered, but breeding may be so widely dispersed that it must always remain difficult to find immature stages. The habitats of other species are also described. RODRIGUES DA SILVA (p. 286) has published a thesis on kala azar as it is found in Brazil.

PYNE and CHAKRABORTY (p. 703) describe the fine structure of the flagellum of the leptomonad stage of *L. donovani*. CHATTERJEE and GHOSH (p. 140) discuss the metabolism of sucrose by *L. donovani*; a sucrose-splitting enzyme has been detected in crude cell-free extracts of the organism.

JENKINS *et al.* (p. 929) found low albumin and high gamma globulin levels in the sera of East African patients with kala azar. A similar result is recorded by SHANKER (p. 929). CHATTERJI and SEN GUPTA (p. 24) found that the urinary excretion of 17-ketosteroids was low in a group of patients with kala azar, but they note that since the same is true in malnutrition and debility it cannot be assumed that in these cases the low output was due specifically to kala azar.

RODRIGUES DA SILVA and DE PAOLA (pp. 24, 140) refer to a form of fibrosis of the liver which they think is characteristic of kala azar. The reticulo-endothelial changes include hypertrophy and hyperplasia of the heavily parasitized Kupffer cells, and there is marked proliferation of the argyrophil fibres, leading to intracellular fibrosis. The reticulo-endothelial changes are probably concerned with the proliferation of the argyrophil cells and with the dysproteinaemia, conditions which are peculiar to kala azar.

BRENER and PELLEGRINO (p. 286) carried out precipitin reactions with polysaccharide fractions from *Trypanosoma cruzi* and *L. brasiliensis* in kala azar patients and in dogs infected with *L. donovani*. Reactions were positive in most instances to both antigens, and since this test, with *T. cruzi* antigen, may be used with the object of differentiating between acute Chagas's disease and kala azar, it is important to remember that this cross reaction occurs. PELLEGRINO *et al.* (p. 600) have used an antigen from *Myco. butyricum* in a complement-fixation test for kala azar, obtaining strong reactions. Negative results were obtained for patients with certain other diseases, but there were cross reactions with leprosy and tuberculosis. The antigen is easily prepared.

PARONIKYAN (p. 704) notes that white mice can satisfactorily be infected intravenously with *L. donovani*, and can be used for screening drugs. STAUBER *et al.* (p. 427) describe a technique in which an 8-day period is used for screening drugs against *L. donovani* in hamsters. The infection is conveyed by intracardiac injection.

BEVERIDGE *et al.* (p. 25) describe a new series of 8-aminoquinoline compounds which are active against leishmaniae and (in some cases) against *Plasmodium gallinaceum*; they are more active than pentavalent antimonials or diamidines, and are effective by mouth.

CUTANEOUS

In a focus of visceral leishmaniasis in Rumania, where *P. perfiliewi* has been recognized, LUPAŞCU *et al.* (p. 425) have now found leishmaniae in the bone marrow of a few dogs. ELISEEV *et al.* (p. 287) report on natural foci of cutaneous leishmaniasis in the Bukhara district of the Uzbek S.S.R., where

there is a high proportion of infection among gerbils (*Rhombomys opimus*) which represent the reservoir hosts of human infection.

GARNHAM and LEWIS (p. 930) describe the cutaneous form of leishmaniasis known in British Honduras and other parts as chiclero's ulcer, or bay sore, and which is due to *L. brasiliensis* or a biological variant, probably transmitted by *Phlebotomus*. The disease is probably a zoonosis, as in Panama where the spiny rat (*Proechimys*) has been incriminated, but the mammalian host has not been identified. The authors think that immunization would be possible, preferably with appropriate strains of *L. tropica*.

Both cutaneous and muco-cutaneous forms of leishmaniasis exist in Colombia, and REYES (p. 705) points out that they are usually found near the large rivers, at altitudes of 1000–1200 metres, and that males are chiefly affected. The muco-cutaneous form is the more common and the more difficult to cure. Classical therapy with tartar emetic is satisfactory, and Glucantime is useful. FORATTINI *et al.* (p. 1226) report cutaneous leishmaniasis in the Amazon region of Brazil, in miners and agricultural workers. There is no muco-cutaneous involvement. Several sandflies are present, of which *P. squamiventris* feeds readily on man.

HERRER (p. 29) found cutaneous leishmaniasis at 900–3000 metres above sea level in Peru.

From Venezuela CONVIT (p. 931) describes leishmaniasis tegumentaria diffusa, a new form of cutaneous leishmaniasis which is due to an organism immunologically and morphologically distinct from *L. brasiliensis*. It was grown on Davis medium and proved pathogenic for laboratory animals and man, producing typical cutaneous lesions.

DEPIEDS *et al.* (p. 704) used an antigen from *Trypanosoma equiperdum* in an intradermal test which was positive in 4 cases of cutaneous leishmaniasis but not in 2 with other skin lesions, or in 63 controls. The same test was used by RANQUE *et al.* (p. 705) in visceral leishmaniasis but was negative. The antigen reacts only in leishmaniasis in which the skin is involved. For American cutaneous leishmaniasis CORRÊA and AMATO NETO (p. 931) use an intradermal test with an antigen prepared from *L. brasiliensis* subjected to the action of ultrasonic waves.

OTHER LEISHMANIAE

HEISCH (p. 521) describes *L. adleri* sp. nov. from lizards in Kenya, and notes that flagellates found in *P. clydei*, which normally is closely associated with these lizards in their burrows, closely resemble them. *P. clydei* is probably the vector. The determination of vectors of human leishmaniasis has sometimes been based on experiments with wild sandflies, but these may be naturally infected with reptilian leishmaniae; it is therefore important to use laboratory-bred flies for this purpose. MOHIUDDIN (p. 813) showed that *L. adleri* could not be found in blood or organs of infected lizards, but only by culturing the heart blood. He failed to infect lizards with *L. tropica* and *L. donovani*.

Charles Wilcocks

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control;* Animal malaria—*monkeys, other animals, birds.*

LIVADAS, G. A. **Malaria in Ancient Greece.** *Riv. di Parassit.* Rome. 1959, Dec., v. 20, No. 4, 299–304. [10 refs.]

BRUCE-CHWATT, L. J. **Malaria Research and Eradication in the USSR. A Review of Soviet Achievements in the Field of Malariology.** *Bull. World Health Organization.* Geneva. 1959, v. 21, No. 6, 737–72, 1 map. [Numerous refs.]

This review covers more than the title would indicate; the history of malaria, the structure of the health services including their academic, advisory, operational and other groups, Russian contributions from the time of LAVERAN's discovery onwards to the parasitology, entomology and epidemiology of malaria, its clinical forms, chemotherapy and of course its control, with progress first to elimination as a mass disease and finally to the later stages of eradication. It is based on a close knowledge of the people as well as of the literature involved, covering a vast amount of material and concluding with a bibliography of 125 references, about 100 of which are to the key papers of Russian work.

There are in Russia about 208 million people, most of whom live in areas which might be malarious though the instability of the disease has caused great fluctuations in the actual numbers affected. The Black Sea littoral, the valley of the Volga and the Caucasus have been notorious centres; the epidemic of the early 1920's focussed world attention on it, but was also the origin of the organization which has now brought it to an end. Much of the malaria is due to *Plasmodium vivax*, the form with the long incubation period being widespread in northern Russia; the other species are common elsewhere, particularly in the semi-tropical areas, and they are carried in different places by *Anopheles maculipennis messeae*, *A. maculipennis*, *A. labranchiae atroparvus*, *A. superpictus*, *A. sacharovi*, *A. pulcherrimus*, *A. hyrcanus* or *A. pattoni*. Much past work as well as what is recent had admittedly gone unnoticed by English speaking malariologists, and though the early contributions of such people as DANILEVSKY and METCHNIKOV are well known, there are many other contributors whose names are now new to the reviewer.

The review of scientific contributions gives an impression of continuous vitality and originality with an emphasis which is more strongly on the strictly epidemiological chain of transmission than elsewhere. Much attention has been paid to the time element in transmission, the intervals between infective cases, infective mosquitoes and secondary cases and the relationship of outbreaks to successive ovipositions by anophelines emerging from hibernation. Phenology [" Study of the times of recurring natural phenomena, especially in relation to climatic conditions." *O.E.D.*] has been an important segment of research and has produced rich rewards in facilitating the accurate and economical timing of control measures. Prominent among recent names of those who have contributed to knowledge are BEKLEMISHEV on the biology of

anophelines, PAVLOVSKY on parasitology, MOSHKOVSKY on epidemiology, DETINOVA on the biology of mosquitoes and SERGIEV for his epidemiological contributions, but most prominently for his management of the successful eradication schemes.

The principle of general control, enunciated in 1934 and established as a practical proposition in 1951, was extended to elimination as a mass disease in 1952 and then to eradication from the Russias in 1955. The programme is basically similar to those elsewhere though it differs considerably in detail and emphasis, more prominence being given to early discovery of cases, intensive treatment and careful follow-up over 2 years than perhaps in any other country. It is given the highest priority, coming before the use of DDT and BHC, the first as one application a year in a dose varying from 1 to 2 gm./m.^{2} according to locality, and the second at a dose of 2 gm./m.^{2} but in one or two applications. In 1959 malaria remained noticeably prevalent in one Republic only, Azerbaidzhan, in 5 others it was prevalent in small foci only, while in the remaining nine Republics only 2 cases, one indigenous and one imported, were found and the total number of cases or asymptomatic carriers discovered throughout the whole of the Union was 4,839.

[Dr. Bruce-Chwatt is to be congratulated on an exceptionally valuable review which ably covers an enormous field and should be of great interest to all interested in the epidemiology or control of malaria.] *G. Macdonald*

RUSSELL, P. F. **Daniel Drake—Outstanding Pioneer in the Epidemiology of Malaria in America.** *Riv. de Parassit.* Rome. 1959, Dec., v. 20, No. 4, 371–8. [13 refs.]

MURPHY, D. H. & GISIN, H. **The Preservation and Microscopic Preparation of Anopheline Eggs in a Lacto-Glycerol Medium.** *Proc. Roy. Entom. Soc. of London.* Ser. A. 1959, Dec. 31, v. 34, Pts. 10/12, 171–4. [14 refs.]

Anopheline eggs for preservation were obtained from gravid females at the expected time of oviposition by dissection. Eggs were placed in a medium consisting of one part of lactic acid, 8 parts of glycerol and one part of a half saturated solution of picric acid in glycerol; dry reagents were used. Complete egg batches from individual females were stored in the above medium by being drawn into 15 × 1 mm. capillary tubes. Permanent mounts were made by placing the eggs in the medium in specially made cavity slides, 0·2 mm. deep cavity, and ringing the coverslips with a mixture of paraffin wax and lanolin.

The medium was found suitable for the preparation of exochorion mounts which could easily be dissected from the preserved eggs. *E. R. Nye*

See also p. 650, PARRISH, **The Mosquitoes of Turkey.**

CHOW, C. Y., IBNOE, R. M. & SOEJOED TARKO JOSOPOERO. **Bionomics of Anopheline Mosquitos in Inland Areas of Java, with special reference to *Anopheles aconitus* Dön.** *Bull. Entom. Res.* 1960, Jan., v. 50, Pt. 4, 647–60.

This paper is concerned with the bionomics of *Anopheles aconitus*, the principal vector of malaria in Java, *A. maculatus* which is believed to be an

important vector in highland areas, and other species of *Anopheles* collected between the years 1957 and 1958. Two villages were surveyed, one near Malang City, East Java, and the other in a hilly area of West Java.

A. aconitus is found throughout the year with a peak of abundance from March to May, coinciding with the harvest time of the first rice crop. This species is exophilic and nearly 3 times as many females were captured biting man outside houses as were caught inside. Most feeding on man out-of-doors took place before midnight, whereas on cattle indoors most feeding took place after midnight. Females may rest in cattle sheds for 2 hours after a blood meal. Out of 359 females captured out-of-doors, 17% were positive for human blood.

A. maculatus is also found throughout the year in hilly areas, although few mosquitoes were found in houses in the area investigated. This species readily enters cattle sheds and also rests out-of-doors. No malaria infections were found in females of either *A. maculatus* or *A. aconitus* from the village in the hills.

Other species of *Anopheles* were also recorded but none of these appears to be important in the transmission of malaria. *A. vagus* was present throughout the year and, in contrast with *A. aconitus*, was more frequently found feeding indoors. The number of *A. vagus* captured on human bait inside houses was approximately three times the number of those found just outside. *A. annularis*, *A. kochi*, *A. barbirostris*, *A. subpictus malayensis* and *A. tessellatus* were believed mostly to feed on animals other than man. *B. R. Laurence*

López Antuñano, F. J. Microscopia en malaria humana. **[Microscopy in Human Malaria]** *Salud Pública México.* 1959, Oct.–Dec., v. 1, No. 2, 139–68, 1 fig. + 12 pls.

A new detailed account of methods and of appearances found.

Campos, R., Elkis, H., Amato Neto, V., Meira, J. A. & Passalacqua, C. de S. P. Transaminase glutâmico-oxalacética no sôro de pacientes com malária. **[Glutamic-Oxalacetic Transaminase in the Serum of Malaria Patients]** *Rev. Inst. Med. Trop. São Paulo.* 1959, Nov.–Dec., v. 1, No. 4, 273–5. English summary.

The values were normal in 27 patients with *Plasmodium vivax* infections, except for a very slight rise in a few.

Datta, S. P. **Liver Enlargement in Malaria.** *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1958, Sept., v. 6, No. 5, 163–8. [13 refs.]

The liver enlargement in malaria reported by earlier workers could be attributable to a combination of malaria and a low protein diet. The present studies were carried out mainly in meso- and hyperendemic areas in the districts of Hardoi and Sitapur in Uttar Pradesh. The liver census was carried out by means of a modification of Hackett's technique [this *Bulletin*, 1955, v. 52, 736]. A nutritional survey of the children was also done and evidence sought for a history of other tropical diseases, such as amoebiasis or leishmaniasis.

In a hypoendemic area 10·9% of children [7 of 64] with splenomegaly also had hepatomegaly compared with 21·5% [11 of 51] in mesoendemic areas. Hepatomegaly was noted in 4 of 12 children with class III and IV spleen enlargement in both areas. Liver enlargement was commoner and more marked in vegetarians [13 out of 18] while all children with hepatomegaly also showed signs of deficiency of iron, vitamins A and C and calcium. The average milk consumption was only 4·5 oz. per child. *Philip Manson-Bahr*

KIKUTH, W. Bastianelli, ein Wegbereiter der modernen Malariatherapie. [**Dr. Bastianelli, a Promoter of Modern Antimalarial Chemotherapy**] *Riv. di Parassit.* Rome. 1959, Dec., v. 20, No. 4, 293–8.

CALERO ELORDUY, C. Evolucion del tratamiento antipaludico. [**Evolution of Antimalarial Treatment**] *Salud Pública México.* 1959, Oct.–Dec., v. 1, No. 2, 195–206.

HERTZBERG, R. **Corneal Oedema due to "Chloroquine".** *Med. J. Australia.* 1960, Jan. 23, v. 1, No. 4, 131–2.

This occurred in an elderly woman with rheumatoid arthritis who had been treated with 200 mgm. chloroquine twice daily for 5 months.

GILROY, A. B. **The Rôle of Drugs in Malaria Eradication in South-East Asia.** *Indian J. Malariology.* 1959, Mar., v. 13, No. 1, 1–5. [12 refs.]

It is now generally recognized that the administration of antimalarial drugs is an essential feature in the planning of an eradication programme. In the later stages such drugs may be used to accelerate the elimination of the parasite reservoir and the interruption of transmission and to deal with residual foci and migratory cases. In areas where the mosquito vector is an outdoor feeder, or, if it feeds indoors, leaves the house without alighting on any sprayed surface, the use of drugs as a supplementary measure becomes all the more important. In regions where tribes are nomadic in their habits or live in remote and inaccessible areas which cannot be reached by spraying teams, chemotherapy may be the only antimalarial measure available. In large countries such as India where eradication programmes may not start simultaneously in every province, drugs may be useful as a supplementary measure to accelerate the progress of the late starters.

While the importance of chemotherapy in malaria eradication programmes is thus recognized in theory, the author emphasizes that formidable obstacles are likely to be encountered in its practical application. He discusses the use of antimalarial drugs in special situations, including the use of medicated salt [this *Bulletin*, 1955, v. 52, 10], and the various difficulties of administering them. In Assam, where urine tests were used to check the administration of proguanil, he found that only 56% of tea estate labourers said to have been issued with tablets had actually swallowed them [*ibid.*, 1952, v. 49, 1025]. "Too often it becomes apparent that the greatest hindrance to malaria eradication, and the greatest challenge to the malariologist is in fact, man himself." *G. Covell*

GÖKBERK, C. **Increase in Incidence of Malaria Cases in Adana Region, Turkey, on the Resistance of Vector *A. sacharovi* to Insecticides.** *Riv. di Malariologia.* 1959, Dec., v. 38, Nos. 4/6, 197–211, 3 figs. (1 on folding pl.) [36 refs.]

[See this *Bulletin*, 1960, v. 57, 212.]

MSANGI, A. S. **The Value of a Spreading Agent in Larvicidal Formulations containing DDT.** *Bull. World Health Organization.* Geneva. 1959, v. 21, No. 6, 773–8.

For many years since the introduction of low volume mosquito larvicides containing DDT, it has been assumed that spread-aiders are necessary [see MACDONALD, this *Bulletin*, 1946, v. 43, 885]. Since natural waters are often contaminated with surface films, it seems logical that a larvicide should have a spreading pressure able to overcome them. Observations in W. Africa showed that about half the natural pools tested required oils spreading against 20 dynes/cm. and a quarter required 30 dynes/cm. [TOMS, *ibid.*, 1950, v. 47, 567].

Despite these theoretical arguments, the necessity of spreading agents in DDT-containing oils does not seem to have been proved necessary. Dubious results from field work led to the present investigation in which Shell Malariol HS, which contains about 5% DDT together with spreading agent (= 35 dynes/cm.), was compared with similar oil containing DDT but no spread-aider (= 16 dynes/cm.). Some tests were done in artificial pools to which laboratory bred *Anopheles gambiae* were added. Tests of the surface film present gave figures from 10 to 30 dynes/cm. Nevertheless, collections of larvae 24 hours later showed no improvement of kill due to the spreading agent. Trials were also carried out in natural pools containing *A. funestus*, *A. coustani* and culicines. Again, no better results were achieved with the high spreading oil. The final experiment, which gave a similar answer, involved an artificial stream, made by by-passing water from a natural stream through a concrete sided bed, with a mud bottom and introduced vegetation.

The author concludes that spreading agents are not so important, as formerly believed, for oil larvicides containing potent insecticides. This may be partly because wind, current, etc., may tend to disperse oil films even when they would not spread on still water. Also, perhaps, it may not be essential for the actual oil to contaminate the larvae. The insecticide may get into solution in the water or fine particles may get dispersed and swallowed by the larvae after the oil evaporates. *J. R. Busvine*

KUHLOW, F. **On the Behaviour of *Anopheles funestus* in unsprayed and DDT Sprayed Houses.** *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1959, Nov., v. 10, No. 3, 328–33.

The response of vectors of malaria (*Anopheles gambiae* and *A. funestus*) to indoor deposits of DDT was studied in a village 8 kilometres from the area of the Mass Malaria Control Campaign in Sokoto, Northern Nigeria [this *Bulletin*, 1958, v. 55, 863]. This work was undertaken as part of the investigations on the causes of persisting malaria transmission in the Sokoto scheme.

One village hut was sprayed with DDT and another, 10 metres away, was left untreated. Treatment was repeated after 6 months.

For a year after the initial spraying the huts were baited with 5 (usually) Africans on 5 nights each month and certain collections of mosquitoes made in the mornings, *viz.*: from an exit window-trap; from a sheet lying overnight on the floor; and, finally, from a fresh sheet after a space-spray to knock down resting mosquitoes. The mosquito population entering each hut per night is accepted as the sum of these three collections. Results for *A. funestus* are reported; those for *A. gambiae* are to follow elsewhere. For the former species, the totals for the year were 1,185 females for the untreated hut and only 392 females for the treated hut. Their distributions in catches were as follows: *untreated hut*—1% on overnight sheet, 53% in trap, 46% resting on walls; *treated hut*—25% on overnight sheet, 70% in trap, 5% resting on walls. A table gives the details per month. In general, the same relative distribution of the catches was evident until the DDT had lost much of its effect just before the re-spray. There is, however, a rather firm conclusion that the DDT actually repelled some of the *A. funestus* population from entering the treated hut. It is simply said that this was not evident with *A. gambiae*.

[It will be important to have these results for *A. gambiae*, as this contrast between the species seems the most critical indication of repellence of *A. funestus*. Otherwise, the present data for *A. funestus* could be explained by loss from the DDT-treated hut of dying mosquitoes removed by predation from the overnight sheet, or their escape, after excito-repellence on contact, not into the trap but by the eaves or other route. (The huts had a conical roof.) It could even be that the differences between *A. funestus* numbers in the two huts, and the lack, one understands, of this with *A. gambiae*, result from different behaviour of these species after contact with the insecticidal deposit. Comparison of actual numbers entering by, for example, catches on bait boys indoors for at least some period of a night seems an important supplement in work of this nature. These considerations in the interpretation of DDT effects on indoor mosquito catches are not new concepts. The author's conclusion may be correct, but the data available seem explicable by these other factors which seem not to be taken into consideration in interpreting the results.] *D. S. Bertram*

SHAMASASTRY, H. & NARAYANA IYENGAR, M. A. **First Year's Results of a Pilot Study of Malaria Surveillance Measures in Mysore State, India.** *Indian J. Malariology*. 1959, Mar., v. 13, No. 1, 35–65, 2 maps. [11 refs.]

The use of residual insecticides for the control of malaria has been practised in Mysore State since 1946. In 1953 these activities were merged in the National Malaria Control Programme whose objective is now the total eradication of malaria from India.

The studies here described were undertaken to determine and test the working procedures of surveillance formulated for the last year of the attack phase and the subsequent 3 years of the maintenance phase of the 6 years' eradication programme commencing in 1958.

There has recently been a rearrangement of the various territories in this part of India, parts of Bombay and Madras States being now integrated with

the original State of Mysore. The former Mysore State is covered by a network of primary and secondary health units, while in the integrated districts there is no such organization. The whole region under survey consists of 2 zones, in one of which the mosquito vector is *Anopheles culicifacies*, in the other *A. fluviatilis*.

The surveillance work started in October 1956. In the first 18 months 13 positive blood smears were encountered (8 *Plasmodium vivax*, 4 *P. falciparum*, 1 mixed *P. vivax* and *P. falciparum*).

For surveillance purposes the State was divided into 5 areas, the pattern of surveillance varying somewhat in each according to local circumstances. Findings are shown in very great detail. Details of the organization adopted in each area are discussed and suggestions made for certain modifications. The authors consider that the patterns of surveillance tested lend themselves for adoption in other areas of India during the maintenance phase of the National Malaria Eradication Programme. It is as yet too early to predict the future course of malaria in the region studied. *G. Covell*

VÀRGAS, L. Aspectos socioeconómicos de las zonas rurales mexicanas en relación con la erradicación del paludismo. [**Socio-Economic Features in Rural Areas in Mexico in Relation to Malaria Eradication**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1958, Dec., v. 18, Nos. 3/4, 147–86, 5 graphs. [15 refs.] English summary (8 lines).

DEVAKUL, K. & MAEGRAITH, B. G. **Lysis and other Circulatory Phenomena in Malaria** (*Plasmodium knowlesi*). *Ann. Trop. Med. & Parasit.* 1959, Dec., v. 53, No. 4, 430–50, 6 figs. [22 refs.]

In this investigation the part played by lysis in *Plasmodium knowlesi* infection in rhesus monkeys has been studied both *in vivo* and *in vitro*. The findings of interest in the erythrocyte counts in infected animals were as follows. When haemolysis occurred there was a marked fall in numbers of red cells related to schizogony and haemoglobin occurred free in plasma and urine. In the non-haemolytic type of infection a fluctuation of red cell numbers took place, partly as a result of variations in plasma volume. In acute infections associated with circulatory failure a precipitate fall in red cell numbers resulted from stagnation in blood vessels.

The part played by lysis in these conditions was studied by following the fate of normal red cells labelled with ^{59}Fe injected at intervals into an infected animal, as well as that of the tagged cells of a previously infected host and of labelled infected cells injected into an uninfected host. Red cells were tagged by injection of ^{59}Fe to an animal subcutaneously. A volume of 0·1 to 0·2 ml. blood was used to measure radioactivity either of beta or gamma rays. The results indicated that normal red cells did not behave differently from infected red cells and it was concluded that lysis played a significant part in red cell destruction. To determine the part played by phagocytes in removal of these cells proved difficult. During *in vitro* experiments the fragility of washed red cells from radioactive blood of normal and infected animals in physiological saline was studied after shaking or incubation. The amount of lysis was

measured by determining the radioactivity of the supernatant after centrifugation. By this means the fragility of the red cells was studied from normal animals, from infected animals whose blood was radioactive and from infected animals which had been injected with radioactive cells. The stability of red cells was not correlated with the stage of infection. It appeared that lysis occurred owing to changes in the cells themselves as well as in the fluid which bathed them, and resembled similar changes occurring in *Babesia* infections. In studying the effects of homologous and heterologous tissues upon erythrocytes from infected animals a technique already described [this *Bulletin*, 1943, v. 40, 584] was used. Liver tissue of rodents increased lysis of normal monkey erythrocytes and the effect was often decreased or prevented by serum. Washed or heated liver tissue was much less active. The behaviour of red cells and plasma from monkeys infected with *P. knowlesi* was also studied.

There is still no simple explanation why lysis occurs in some hosts and is absent in other cases in the same host species similarly infected.

J. D. Fulton

Fabiani, G. Le paludisme expérimental (à *Plasmodium berghei* et à *Plasmodium vinckei*). Son intérêt en immunologie générale. [**Experimental Infections with *Plasmodium berghei* and *P. vinckei* and their Significance in General Immunology**] *Algérie Méd.* 1959, Sept., v. 63, No. 9, 793–9. [64 refs.]

A review.

TRYPANOSOMIASIS

In this section abstracts are arranged as far as possible in the following order:—African—*human, animal;* American—*Chagas's disease and other trypanosome infections. In each form the following order is followed:*—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.*

Commission for Technical Co-operation in Africa South of the Sahara. International Scientific Committee for Trypanosomiasis Research. Seventh Meeting. Brussels, 25–30.8.1958, pp. vii + 406, illustrated. [Numerous refs.] [1960.] Publication No. 41. London: Abbey House, 2–8, Victoria Street, S.W.1. Bukavu: B.P. 949, Belgian Congo.

This is the report of the seventh meeting of the International Scientific Committee for Trypanosomiasis Research, held in Brussels in August 1958, over a period of 5 days. The business of the Committee was transacted, and 44 papers were submitted for consideration—9 on human trypanosomiasis, 21 on tsetse flies and 14 on animal trypanosomiasis. The papers have been published in full in their original language; mention will not be made of those dealing with work with which readers of this *Bulletin* are already familiar, or with those of more remote interest.

E. Van Oye summarized *The evolution of human trypanosomiasis in the African countries during the last ten years* (pp. 201–206) in a series of tables, showing the annual number of new cases, and the infection rate per 10,000 of the population of each territory: whereas the total of new cases of

Trypanosoma gambiense infection for all countries combined has fallen steadily from 53,408 in 1948 to 14,874 in 1957, the total of new *T. rhodesiense* infections has fluctuated between 854 and 2,066 per annum and was rather higher in 1957 than in 1948. J. DEMARCHI, following on a questionnaire submitted to all countries, produced a *Report on the chemoprophylaxis of T. gambiense trypanosomiasis* (pp. 101–139); he concluded that, although the method had given spectacular results, residual foci remain and vigilance cannot be relaxed. The committee recognized that the factors restricting the use of chemoprophylaxis are mainly of an administrative, social and economic nature. I. K. HAY described *The use of chemoprophylaxis in the control of trypanosomiasis in Northern Nigeria, with particular reference to the diamidines* (pp. 167–177), and expressed the view that it is a powerful though temporary control measure which should be used when other methods have failed, or are impracticable. A. DE ANDRADE SILVA (pp. 95-99), in his *Report on the chemoprophylaxis of T. rhodesiense sleeping sickness*, stated that the measure has been used only in Mozambique and Ruanda-Urundi where it was most valuable when the disease was in epidemic form, but that it would be impracticable under the usual conditions of low endemicity; Bayer 205 and pentamidine were found to be equally good. T. A. M. NASH discussed *The effect of different types of man-fly contact upon the distribution of T. gambiense sleeping sickness in Nigeria* (pp. 191–196). J. R. BAKER, D. H. H. ROBERTSON and G. B. LOMAX described *The characteristics of strains of trypanosomes isolated from persons infected with human trypanosomiasis in East Africa* (pp. 179–185); they had worked on 24 strains of *T. rhodesiense*, 22 of them from the north-east corner of Lake Victoria, and had studied their virulence to rats, their morphology and susceptibility to tryparsamide. M. VAUCEL and H. FROMENTIN told of *New observations made in the course of experiments in infecting with mixed strains of polymorphic trypanosomes* (pp. 187–189), and confirmed that the strain with the more rapid rate of multiplication, and ultimately the greater virulence, submerges the other; there was no evidence of the creation of a hybrid strain. B. WEITZ indicated how *The immunological approach to problems relating to trypanosomiasis* (pp. 71–78) could be applied to future studies, and stressed the need to investigate the process of immunity and the antigenic constitution of trypanosomes.

J. FRAGA DE AZEVEDO, J. TENDEIRO, L. T. DE ALMEIDA FRANCO, M. DA C. MOURÃO and J. M. DE CASTRO SALAZAR reported *The reappearance of Glossina on Principe Island* (pp. 321–330), 42 years after the eradication of *G. palpalis*; so far, no trypanosomes have been found in man, domestic animals or tsetse. P. E. GLOVER, J. G. LE ROUX and D. F. PARKER described *The extermination of Glossina palpalis on the Kuja-Migori river systems with the use of insecticides* (pp. 331–342); the incidence of sleeping sickness was greatly reduced by the eradication of tsetse from over 300 miles of heavily-forested river bank in South Nyanza, Kenya. A. ESTEVES DE SOUSA presented a paper on *The use of phytocides to control stump and other secondary plant growth in areas cleared against Glossina austeni* (pp. 273–290). W. A. PAGE and A. M. JORDAN assessed *The economic importance of some West African species of fusca group tsetse flies* (pp. 313–314), having studied their infection rates. A. M. JORDAN, W. A. PAGE and W. A. MCDONALD reported the *Progress made in ascertaining the natural hosts favoured by different species of tsetse* (pp. 315–317); of 516 meals identified from 6 species of tsetse in the

forest belt in Nigeria, human blood was found only in *G. palpalis*. B. WEITZ, W. P. LANGRIDGE, P. NAPIER BAX and F. LEE-JONES dealt with *The natural hosts of Glossina longipennis Corti and of some other tsetse flies in Kenya* (pp. 303–312); *G. longipennis* seems to have a pronounced preference for rhinoceros. H. A. W. SOUTHON recounted his *Night observations on G. swynnertoni Aust.* (pp. 219–221): at dusk the flies move from the underside of branches and settle on leaves, usually on the upper surface. T. A. M. NASH, W. A. PAGE, A. M. JORDON and W. PETANA described advances made and the technique evolved for *The rearing of Glossina palpalis in the laboratory for experimental work* (pp. 343–350). R. FOSTER contributed *Some observations on the breeding of Glossina morsitans in the laboratory* (pp. 351–355).

R. S. MARSHALL dealt with *Animal trypanosomiasis: control measures by means of drugs* (pp. 13–24), largely confining his attention to drugs on trial or in current use, whereas D. G. DAVEY, in his review of *The chemotherapy of animal trypanosomiasis with particular reference to the trypanosomal diseases of domestic animals in Africa* (pp. 25–45), included an account of the earlier work and of the chemical constitution of the drugs referred to. (Davey's paper was originally published in *Veterinary Reviews and Annotations*, 1957, v. 3, Part 1.) E. F. WHITESIDE summarized four years of experience in Kenya on *The maintenance of cattle in tsetse-infested country* (pp. 83–90), relying chiefly upon drugs. I. M. SMITH and B. D. RENNISON discussed *Some factors concerned in trypanosome challenge* (pp. 63–66). D. G. GODFREY dealt with *Variations in pathogenicity amongst congolense-like trypanosomes in relation to their morphology* (pp. 79–81), and in particular with one newly isolated strain, possibly *T. dimorphon*, which is much more virulent and significantly longer than the strains of *T. congolense* previously encountered. M. DE ANDRADE SILVA and J. MARQUES DA SILVA contributed data *On the incidence of trypanosomiasis in game* (pp. 269–272) from some thousands of blood smears.

T. A. M. Nash

EAST AFRICA HIGH COMMISSION. **East African Trypanosomiasis Research Organization, Tororo. Report No. 9, 1958** [LUMSDEN, W. H. R., Director]. pp. ii + 91. 12 figs. 1959. Nairobi: Govt. Printer. [Sh. 7/50.]

The Director starts this report by describing the considerable changes in organization and policy made during 1958. To achieve greater co-ordination in research, the laboratories at Shinyanga and Tinde in Tanganyika Territory have been closed, and all the disciplines have been concentrated at the Tororo headquarters in Uganda. In future, a smaller part of the research effort of EATRO will be devoted to the elimination of the insect vector; greater attention will be paid to the mechanisms of transmission and maintenance of trypanosomes in nature, the host's reactions to trypanosome infection, trypanosome physiology and biochemistry and to studies of the action of drugs on the trypanosome *in vitro* and *in vivo*.

The description of the year's work deals first with protozoology. The collection of trypanosome strains, which are preserved by deep freezing, continues: 13 strains of *Trypanosoma rhodesiense* and 2 of *T. gambiense* have been preserved, and 64 samples of veterinary trypanosomes. In the search for a laboratory method of maintaining *T. vivax*, a wild mouse, *Arvicanthis abyssinicus*, was investigated, but was found to resemble laboratory rats and

mice in being insusceptible; an attempt to cultivate this trypanosome in embryonated eggs has so far failed, as has the method of giving white rats supplementary injections of normal sheep serum, a method used with success in West Africa [see this *Bulletin*, 1952, v. 49, 936; *Ann. Trop. Med. & Parasit.*, 1953, v. 47, 247; this *Bulletin*, 1954, v. 51, 1151]. With *T. brucei* in guineapigs and *T. rhodesiense* in rats, it was found that a larger inoculum always results in a shorter prepatent period, and usually in a shorter length of life after trypanosomes first appear in the peripheral blood. Trials have been made with two diagnostic tests—the double-diffusion precipitation reaction and the SOLTYS agglutination test [this *Bulletin*, 1958, v. 55, 739]. Various other studies are reported.

The report then deals with entomology. It has been confirmed that carbon dioxide can be attractive to *Glossina pallidipes* and that, when used in a trap, it may effect a three-fold increase in the catch. New methods of handling and maintaining *G. pallidipes* in the laboratory have been devised. Studies have been made on the metabolic rate and water loss of tsetse during flight, and on the effect of discriminative clearing on the physiological condition of tsetse populations. A new method of studying the behaviour of tsetse at night consists in marking flies with an adhesive and microscopic glass beads, which will reflect light from a 6-volt torch battery at 15 feet. In Ankole, preliminary examination of data suggests that probably over 90% of marked *G. morsitans* are recaptured within 3,000 yards of the point of release. From one-half to three-quarters of a sample of *G. morsitans*, collected from the vicinity of a tank used by 500 cattle for watering, had fed on cattle. The clearing of only the top storey of the vegetation type believed to be essential to *G. morsitans* in Ankole has not been successful. Studies of predators of *Glossina* suggest that certain spiders may play an important part in natural control.

Under chemotherapy and chemoprophylaxis, the toxic reactions occurring in 2 patients with *T. rhodesiense* infection, treated with nitrofurazone together with Mel B, are described, and illustrate the severity of the polyneuropathy induced by nitrofurazone. A brief history is also given of 2 patients, treated with Mel B, in whom autopsy was possible. Provisional results on chemotherapy in horses indicate that the injection site reactions are acceptable when quinapyramine is given subcutaneously at 5 mgm./kgm. and when ethidium bromide and metamidium chloride hydrochloride are administered intramuscularly in the neck at 2·5 mgm./kgm. and 0·5 mgm./kgm. respectively, but that the severity of the local reaction produced by Berenil precludes its use; the systemic effect was least after treatment with ethidium bromide. An experiment on the duration of protection afforded to cattle by salts of metamidium, prothidium and Antrycide Prosalt, in an area of high tsetse density, indicated that the metamidium suramin salt "fine suspension" gave the longest protection. *T. A. M. Nash*

MORRIS, K. R. S. **Studies on the Epidemiology of Sleeping Sickness in East Africa. II. Sleeping Sickness in Kenya.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, Jan., v. 54, No. 1, 71–86, 4 maps. [20 refs.]

In Kenya, Gambian sleeping sickness is confined to Nyanza Province to which it was introduced from Uganda in 1902, spreading rapidly along the

shores of Lake Victoria and up the Kuja and Migori rivers. In the absence of a policy of forcible evacuation of the population, as in Uganda, this first epidemic continued until about 1910, when it was abruptly checked by the spontaneous movement of the people, often by only a mile or so, away from the haunts of *Glossina palpalis*; however, the people soon returned to their villages and the disease then remained for the next decade at a low endemic level. The second epidemic, 1920–30, was controlled by treatment, which had now become available, and by anti-tsetse clearings and settlement. After some years of low endemicity there was a third epidemic period, 1940–50, outbreaks occurring in Central Nyanza, the Nyando River basin and on the Kuja River: the Central Nyanza epidemic was controlled by a very thorough clearing campaign, but the disease lingers on in the Sakwa-Uyoma Peninsula; the Nyando River basin epidemic was controlled by mass survey and treatment followed by tsetse eradication, brought about by spraying the riverine vegetation with DDT, with the result that the disease has almost disappeared; the Kuja River epidemic took 10 years to control, no sooner had one focus been dealt with by clearing than a new one would appear, and even now there are still a few active foci on the upper reaches. The author criticizes the last campaign on the Kuja River system as having been aimed at the tsetse without due regard being paid to the epidemiology of the disease. [*G. palpalis* has been eradicated from over 300 miles of this river system by means of insecticides and barrier clearings, see GLOVER *et al.*, p. 560, above.]

The Sakwa-Uyoma Peninsula, where sleeping sickness occurs in a number of separate areas along the lake-shore, was studied in some detail. The vast majority of cases are found in the fishing villages which are rarely more than three-quarters of a mile from the lake-shore, and whose inhabitants are in daily contact with the tsetse when they spend the mornings at the water's edge dealing with the night's catch. The few cases found well inland are among the fish buyers, but not their families, as these men spend the mornings on the lake-shore meeting the boats. Among farming communities the incidence of the disease is related to the distance of the houses from *G. palpalis*-infested beaches.

The author stresses the need to eliminate the persistent endemic foci when the disease is quiescent, rather than to wait until an epidemic is in progress and infection more widespread.

Rhodesian sleeping sickness, transmitted by *G. pallidipes*, extends from south-east Uganda, just over the border, into the Samia area of Kenya.

[For Part I of this study, see this *Bulletin*, 1960, v. 57, 106.]

T. A. M. Nash

COMMISSION FOR TECHNICAL CO-OPERATION IN AFRICA SOUTH OF THE SAHARA. INTER-AFRICAN ADVISORY COMMITTEE ON EPIZOOTIC DISEASES. **Symposium on Animal Trypanosomiasis.** Luanda, 1958. 170 pp., illustrated. 1960, Jan. Publication No. 45. London: Abbey House, 2–8, Victoria Street, S.W.1.

This symposium was held in July 1958 at Luanda, Angola, and was attended by 24 representatives of countries in Africa and of international organizations,

whose names are listed. The present volume embodies the reports presented, a note on the points discussed and the recommendations and conclusions of the symposium. The papers are of uneven length and vary from half a page to 36 pages. In general, they deal with incidence of trypanosomiasis in animal species, the type of parasite and vectors, topographical factors, economic implications, chemotherapy, and control of tsetse flies.

The documents are set out under 4 topographical headings:

(1) West Africa. This opens with short anonymous reports (in French) from Senegal, Mauritania, Sudan, Ivory Coast and Upper Volta (pp. 15–27). There is then a brief report from Liberia by C. E. W. Baker (pp. 29–31) followed by a short note from Sierra Leone by J. R. Birkett (p. 32): there is no problem in cattle there and few problems in pigs if proper precautions are taken. The position in Ghana is set out in a report from the Department of Animal Health (pp. 32–36). A fuller paper from Northern Nigeria by S. G. Wilson (pp. 37–52) gives the history of animal trypanosomiasis there, an account of surveys and of treatment and current problems.

(2) Central Africa. A paper in French by P. Finelle (pp. 53–63) discusses the various aspects of the disease in Oubangui-Chari and another by V. Herin (pp. 64–80) does the same very fully for the Belgian Congo and Ruanda-Urundi.

(3) East Africa. The control of animals in Kenya is discussed by E. F. Whiteside (pp. 81–116) in a considerable paper which sets out the history, the measures of control from 1920 onwards and appraisal of their value, the current problems and research in progress. J. A. Randall (pp. 117–118) briefly summarizes the position in Uganda.

(4) Southern Africa. An account of control measures in Angola is given by V. S. Dias (pp. 119–124) in French. G. D. Shaw (pp. 125–137) gives a detailed survey of the position in Northern Rhodesia and describes in sequence the measures carried out from 1908 to 1957, setting out the data in groups of years. There is a long account of the position in Southern Rhodesia, under topographical headings by D. A. Lawrence and R. W. Bryson (pp. 138–158) which includes an account of chemotherapy and control, and concludes with a useful summary by the Inter-African Bureau for Epizootic Diseases. K. W. Aspinall (pp. 159–162) summarizes the situation in Nyasaland in a short paper. The disease in Mozambique and its therapy (pp. 163–165) and the tsetse and trypanosomiasis department of that country (pp. 166–170) are described respectively by J. Marques da Silva and M. A. De Andrade Silva.

The following points of special note emerged from the discussion: the problem of control, and therefore its application, varies in regions and countries; cost and practical difficulties of application demand that chemotherapy should be regarded as a palliative measure only where susceptible breeds are involved. Chemotherapy trials can best be done by territorial services having adequate resources and in close relationship with manufacturers: more of the resources of research organizations dealing with animal trypanosomiasis should be devoted to fundamental immunological studies; the method of vector control used must be correlated closely to the subsequent use of the reclaimed land.

The Meeting recognized the need for detailed surveys, which should be standardized as fully as possible: it recommended that in addition to other control measures particular consideration should be given to the economic

application of insecticides: it drew attention to the fact that, while chemotherapy had an important part to play in the control of bovine trypanosomiasis, the use of drugs "in no way removes the need for tsetse eradication on which alone the final solution of the problem depends". In view of varying results in drug testing, the Meeting recommended the wide use of field trials and the full reporting of them by each territory concerned. It sets out in a useful table variables to which particular attention should be paid under the 4 headings of host, parasite, vector and climate/ecology. Finally the Meeting noted the role which animal management and breed resistance can play in the solution of animal trypanosomiasis.

[This symposium underlines once more the necessity for a close link between veterinary and medical workers in this field and is of considerable comparative value to those concerned with the control of trypanosomiasis in man.]

H. J. O'D. Burke-Gaffney

Corradetti, A. & Verolini, F. Comportamento di *Trypanosoma lewisi* in ratti albini reinfettati con ceppo omologo prima o dopo la splenectomia. [**Behaviour of *Trypanosoma lewisi* in Rats re-infected with Homologous Strain before and after Splenectomy**] *Parassitologia*. Rome. 1959, Apr., v. 1, No. 1, 1–10.

The object of the experiments described in this paper was to determine the immune reactions of rats which had recovered from infection with *Trypanosoma lewisi,* by inoculation with the homologous strain—with or without splenectomy. It was found that the infection lasts from 4 to 38 days (average 13·4), after which the trypanosomes disappear completely from the blood, as shown by its non-infectivity to normal rats. Moreover, numerous attempts to reveal the presence of trypanosomes, by splenectomizing the rats after recovery from the primary infection, produced negative results.

It was also demonstrated that recovered rats which were not splenectomized were resistant to re-infection with the homologous strain. The resulting immunity is regarded as being absolute, and not merely premunition. Although splenectomized rats were less resistant to re-infection with the same strain, the secondary infection was eliminated much more rapidly than the primary infection in intact animals, after which repeated challenges failed to infect them.

C. A. Hoare

Da Silva, L. H. P. Observações sôbre o ciclo evolutivo do *Trypanosoma cruzi*. [**Studies in the Life Cycle of *Trypanosoma cruzi***] *Rev. Inst. Med. Trop. São Paulo*. 1959, July–Aug., v. 1, No. 2, 99–118, 18 figs. [37 refs.] English summary.

Though half a century has elapsed since the discovery of *Trypanosoma cruzi*, there is still some controversy regarding the course of its development in the mammalian host. Another unsolved problem concerns the significance of polymorphism among the blood forms. In order to throw light on these problems the author studied the development of 3 human strains of *T. cruzi*. The blood trypanosomes were observed in fresh and stained citrated blood

from infected mice and in hanging-drop cultures of infected fragments of chick embryo tissue [see this *Bulletin*, 1945, v. 42, 972; 1948, v. 45, 983] while the development in the vector was followed in infected nymphs of *Rhodnius prolixus*.

The trypanosomes in the peripheral blood were represented by 4 types: (1) slender forms with subterminal kinetoplast and short free flagellum, (2, 3) large and small broad forms with terminal kinetoplast and long free flagellum and (4) intermediate forms. The 3 strains differed in the proportion of the various forms appearing in the blood of mice: in *Y* slender forms predominated up to the 10th day, after which they were succeeded by large ones, whereas in *L* and *C* chiefly broad forms were present throughout the infection. Broad forms of *C*—isolated by micromanipulation—when inoculated into mice and passaged from these, again gave rise to infection with similar forms, though a few slender forms were also present, indicating that these can be produced by the broad ones. However, when nymphs of *Rhodnius* were fed on mice harbouring broad trypanosomes and their gut contents were inoculated into mice, a high proportion of slender trypanosomes appeared in the latter. *In vitro* observations on flagellates in citrated mouse blood showed that broad trypanosomes were transformed into crithidial forms by migration of the kinetoplast forward, and these gave rise to leishmanial forms, but sometimes the latter were produced directly from trypanosomes by a "rolling up" process. The development of broad forms in the vector proceeded on similar lines. On the other hand, slender trypanosomes underwent no further development *in vitro*, but in the vector they gave rise to small trypanosomes which apparently degenerate.

Further observations on the life cycle of *T. cruzi* were made in tissue culture. The intracellular stage of the parasite was represented by leishmanial forms, which were rounded in some host-cells and fusiform in others. The rounded forms developed into trypanosome forms (of the small broad type) directly, by a process of "unrolling" of the body, whereas the fusiform bodies passed through a crithidial stage before becoming trypanosomes (of the slender and intermediate types).

The author thus confirms the existence in *T. cruzi* of a dual process of development in the mammalian host [see *ibid.*, 1951, v. 48, 793; 1957, v. 54, 547]. However the factors determining the course of development in different cases could not be established but both sexual dimorphism and age differences between the different forms of trypanosomes are excluded. The possibility remains that the development of *T. cruzi* might be influenced by the tropism of the strains used, thus strain *Y* was reticulotropic, while the others were myotropic and neurotropic.

The paper is illustrated by a number of figures showing various forms and stages of *T. cruzi*, as well as a useful diagram of its entire life cycle in the mammalian and insect hosts. *C. A. Hoare*

ZELEDON, R. **Differentiation of** *Trypanosoma rangeli* and *Schizotrypanum cruzi* **in a Liquid Medium, with Notes on the Nutrition of Hemoflagellates.** [Research Notes.] *J. Parasitology*. 1959, Dec., v. 45, No. 6, 652.

A clear medium prepared by adding 10% frozen sheep blood to brain-heart infusion, followed by boiling and filtration through paper then autoclaving,

was found suitable for growth of *Schizotrypanum* [*Trypanosoma*] *cruzi* but not for *Trypanosoma rangeli*. When haematin, washed red cells or horse serum were added to the brain-heart infusion, growth of *S. cruzi* did not occur, but growth was possible when horse serum and haematin replaced whole blood.

Cultures of *S. cruzi* were set up in dialysing sacs in the above medium and *T. rangeli* was added to the outer compartment containing the same medium as within, in which normally *T. rangeli* does not grow. On addition of fresh rabbit blood to the contents of the sac, *T. rangeli* grew in the medium outside. It thus appears that dialysable substances in rabbit blood can ensure growth of this parasite in presence of the above medium. The arrangement makes feasible the separation of the two trypanosomes when they occur together in natural infections. The medium did not appear to contain free ascorbic acid.

Various other protozoa failed to grow in the liquid medium or grew poorly as if some growth factors were present in limiting amount.

From these results the author suggests that *S. cruzi* is the most primitive form, *Leishmania* is intermediate in the phylogenetical scale and *Trypanosoma* more recent. *J. D. Fulton*

De Almeida, J. O., De Freitas, J. L. P. & Siqueira, A. F. Capacidade reativa especifica do antígeno com anticorpo em reações de fixação de complemento para moléstia de Chagas. [**Specific Reactive Capacity of Antigen with Antibody in Complement-Fixation Reaction for Chagas's Disease**] *Rev. Inst. Med. Trop. São Paulo.* 1959, Nov.–Dec., v. 1, No. 4, 266–72, 2 figs. [18 refs.]

The English summary appended to the paper is as follows:—

"The reaction between sera from patients with Chagas' disease and antigen prepared from *T. cruzi* was studied by direct complement fixation technic employing the method of isohemolytic curves.

"Several dilutions of complement were used in the tests with reacting human serum (diluted in saline or normal human serum) and serial dilutions of antigen. Linear relationship between serum and complement was found in reactions obtained with a large excess of antigen; the ratio between antigen and complement was found in an excess of serum. From these relations the reactivity of serum or antigen was given in terms of complement required for 50% hemolysis. The reproducibility of this value, as increment ratio titer, suffers the influence of the conditions in which the test is made, such as diluent, quality of complement and other factors not well known. Variations occurred in both sides of isohemolytic curves in the same directions, in such a way that the ratio between the titer of antigen and that of serum was constant for aliquot parts of the same serum, reacting with the same antigen, even in different conditions of the test. However, when different sera reacted with the same antigen, the values of this ratio were not the same, although the conditions of the tests were kept constant.

"Determination of such a ratio appears to provide a constant index of the specific reactive capacity of antigen and immune serum.

"The quantitative studies provide a method for accurate determination of the avidity of antigen and the immune serum in relation to each other and to the complement."

Scorza, J. V., Alvarez, A., Ramos, Italia, Dagert, Cecilia, Díaz Vásquez, A. & Torrealba, J. F. Nuevo método rápido para el diagnóstico de la enfermedad de Chagas en su fase crónica. (Aplicación del "Dye test" de Sabin y Feldman.) [**New Rapid Method for the Diagnosis of Chronic Chagas's Disease (Application of Sabin and Feldman's Dye Test)**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1959, July, v. 3, No. 1, 121–35. English summary.

In a series of preliminary studies on the effect of human sera on and staining properties of *Trypanosoma cruzi*, the authors have established the following facts. (1) When a suspension of cultural forms of the trypanosome and human serum are mixed in equal quantities (0·1 cc. each) and incubated for 1 hour at 37°C., in the case of normal serum some of the flagellates are immobilized, agglutinated and assume the leishmanial structure, whereas in the case of serum from patients suffering from Chagas's disease these changes affect the great majority of the flagellates. (2) Both normal and immune sera fail to immobilize the flagellates after inactivation for 30 minutes at 56°C. (3) If one drop of 1:2500 solution of methylene blue or toluidine blue (buffered to *p*H 11) is mixed with a drop of washed cultured flagellates, the latter are stained as follows: in the case of methylene blue, the nucleus and kinetoplast acquire a deep blue colour, the cytoplasm shows numerous metachromatic granules; in the case of toluidine blue, the cytoplasm stains deeper, while only the nuclear karyosome and the central part of the kinetoplast take up the dye. (4) If the flagellates are incubated together with the sera for 1 hour at 37°C., those mixed with normal serum stain as in (3), while in those mixed with immune serum the cytoplasmic granules do not stain, the nucleus and kinetoplast standing out against a pale blue or reddish-grey background. (5) When incubated with either normal or immune sera, which had been inactivated for 30 minutes at 56°C., the flagellates are stained as in (3), but if normal serum is added to inactivated immune serum, the lytic action of the latter is restored, with the result that the cytoplasmic granules fail to stain; hence it is inferred that the anti-flagellate factor in immune serum is thermostable and is activated by a thermolabile fraction present in both normal and immune sera.

Having determined by titration that immune antibodies react in dilutions between 1 in 32 and 1 in 64 and that fresh guineapig serum can be used as a source of complement, the authors developed the following procedure for the diagnosis of Chagas's disease by the dye test: (a) the following are mixed in a haemolysis tube and incubated in a water bath at 37°C. for 1 hour: 0·05 cc. of inactivated serum to be tested; 0·1 cc. of fresh guineapig serum; 0·05 cc. of washed suspension of *T. cruzi* from culture; (b) a drop of this mixture is placed on a slide with a drop of 0·25% alcoholic solution of the stain, the preparation is mounted under a coverslip, and examined under an oil immersion objective (× 1000 – 1200).

At least 100 flagellates are inspected for the presence or absence of cytoplasmic granules: the reaction is considered to be positive if over 60% do not show the granulation. This diagnostic method was used in 28 patients with Chagas's disease, in one infected with *T. rangeli* and 13 normal controls, with parallel complement-fixation tests for comparison. While all the controls and the *T. rangeli* sera were negative, in the case of Chagas's disease 100% of the sera gave positive results. The superiority of the dye test over the

complement-fixation test in Chagas's disease is attested by the fact that the latter was negative in 25% of sera from known cases of infection.

C. A. Hoare

KÖBERLE, F. Die Chagaskrankheit—ihre Pathogenese und ihre Bedeutung als Volksseuche. (Beitrag zur 50-Jahr-Feier der Entdeckung der Krankheit durch Carlos Chagas.) [**Chagas's Disease; Pathogenesis and Importance as an Endemic Disease. A Contribution to the Celebration of its Discovery 50 Years Ago**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1959, Nov., v. 10, No. 3, 236–68, 14 figs. [Numerous refs.]

This can well be described as a *eulogium* in honour of Chagas and Chagas's disease discovered 50 years ago, compiled by his disciples for the jubilee celebrations.

Emphasis is laid upon the necessity of distinguishing Chagas's disease from Chagas's infection at the outset. The disease can be transmitted by infected reduviid bugs, by blood transfusion, through diaplacental infection of the foetus, and lastly by trypanosome-containing maternal milk.

The primary complex is the chagoma or inflammatory swelling which soon involves the regional lymph glands: occasionally there is an invasion of the connective tissues producing a unilateral conjunctivitis and swelling known as Romaña's sign, but which was really described originally by Chagas. In the generalized infection we can distinguish an acute phase which may assume different forms. There may be fever, generalized adenopathy, hepato- and splenomegaly, oedema of the skin and subcutaneous tissue, cardiopathy with tachycardia, often with severe central nervous system symptoms, in fact those of a generalized infection, with emphasis on the heart or meninges leading to a fatal issue. This phase may be long drawn-out and necessitates intense investigation; for instance out of the 28 acute cases which RASSI and his colleagues investigated in Goiania, not a single one of the attendant doctors had suspected the correct diagnosis. The diagnosis is too often "influenza infection" or, on account of the oedema, "glomerulonephritis".

In all these cases, in the early stage, the trypanosomes—*T. cruzi*—are very numerous in the blood, but their numbers decrease considerably in the third and fourth weeks. Exceptionally they may persist in considerable numbers for months or even 1 year.

Figures for the mortality of the acute phase differ considerably. Chagas reckoned it as 50% in children, but at present it is about 10%.

After the third or fourth week the parasites disappear, owing to formation of antibodies, so that diagnosis rests upon xenodiagnosis or animal inoculation. Blood culture has to be repeated several times before it is successful. Biopsy of the tissues and organs for pseudocysts is very disappointing. On the entry of the leishmania forms into a cell a period of 5 days elapses before the cyst forms, packed with dividing leishmaniae, and then it bursts and the cells enter other tissues. It is recognized that there are two leishmania forms: the common form and a smaller darker one (MAYER and ROCHA LIMA) which invariably form cysts, and they may exist together with trypanosomes inside the cysts. It appears that those leishmania forms which are not converted into trypanosomes perish, because outside the host cell they cannot maintain themselves and they are responsible for the pericystic inflammatory reactions.

In addition there are frank degenerative lesions of a lytic nature. These lesions are specially to be found in the ganglion cells of the central and peripheral autonomic nervous systems and are frequently overlooked. They are, however, the key to the meaning of many other phenomena about whose aetiology and pathogenesis there have been doubts. In laboratory infections pseudocysts make their appearance in smooth muscle in great numbers in 7–9 days. This is especially the case in the alimentary tract. The lymphatic drainage of the muscular layers of the bowel is affected, especially in the region of the Auerbach's plexus with its associated ganglion cells. *T. cruzi* has a special affinity for muscular tissues and the ganglion cells of the heart and musculature of hollow organs.

Enteromegalia chagasica is the term applied to the dilatation of the viscus. Hypertrophy and dilatation of muscular hollow organs are denoted as megaoesophagus, megacolon, megaureter, etc. Megaoesophagus has been known in São Paulo since 1858 as *mal de engasgo* or *entalo*. The basic cause of all *Enteromegalia chagasica* is damage to the autonomic nervous system of certain hollow viscera. This peculiar denervation has been proved in all hollow viscera—salivary ducts, stomach, duodenum, jejuneum, ileum, colon, gall bladder and bile ducts, urinary bladder, trachea and bronchi.

In 250 autopsies of subjects with Chagas's disease 69 had megacolon and 61 had megaoesophagus. The preponderance of the former may lead to fatal complications, such as volvulus, ileus and rupture, but as a clinical entity megaoesophagus predominates. According to De Freitas the Chagas complement-fixation test is positive in 96%. In some rare cases the bowel evacuation occurs once every 4, and sometimes even 5, months and gigantic faecalomata are formed. Conditions of *dysperistalsis* and *aperistalsis* are recognized.

Cardiopathia chagasica has become a very big subject and the invasion of the heart muscle by leishmania forms may result in great hypertrophy, or extreme dilatation of the cardiac cavities. In the chronic stage the picture is different. The subject may be summarized as follows:—

1. Apparently normal heart with a slight enlargement of the right side and especially the right auricle.

2. Slightly enlarged heart following global hypertrophy with increasing weight. There is usually a cup-shaped depression of the left apex and the cardiac wall is thinned and flaccid. Sometimes there is an aneurysmal dilatation at the apex.

3. Considerable hypertrophy of both sides of the heart with or without aneurysm at the left apex (weight 500 gm.).

4. Global hypertrophy with dilatation especially of the right ventricle.

5. Great global hypertrophy with considerable dilatation, with enlargement of the right side, fibrosis of the cardia, thrombosis and aneurysm; fibrotic nodules in the left ventricular wall and, to a lesser extent, in the right. Thrombosis of the auricular appendix (weight up to 1,000 gm.).

6. High grade cardiomegaly with weights over 1,000 gm. and extreme fibrosis of the myocardium, aneurysms (hen's egg size) in the left ventricular apex, and large thrombi.

The clinical picture of Chagas's cardiopathy can be summarized as follows:—

1. Tachycardia and bradycardia.

2. Disturbances of circulation (lengthening of P-R interval), partial and total heart block.

3. Premature contractions, auricular and ventricular extrasystoles, bundle extrasystoles.

4. Auricular flutter.

5. Paroxysmal tachycardia.

6. Complete arrhythmia.

The remainder of this section is pure cardiology and only intelligible to experienced cardiologists. Regarding the distribution and prevalence of Chagas's disease opinions vary and a greater incidence has been recorded since the recognition of the "megas" as complications. According to the author's autopsy record (illustrated by two graphs) Chagas's disease accounts for no less than 46% of the total. The figures speak for themselves when one considers that no less than 10% of the total number of blood donors are suffering from it. According to the figures issued by the Ministry of Health there are about 4,000,000 suffering from Chagas's disease in Brazil. In other South American countries the figures are not much different. According to TORREALBA in Venezuela the number is at least one million. The specific complement-fixation test, according to the technique of De Freitas and Almeida, is revealing an increasing number of cases throughout the endemic area. *Philip Manson-Bahr*

KÖBERLE, G. & PENHA, P. D. Chagas-Megaösophagus. (Quantitative Untersuchungen des intramuralen Nervensystems der Speiseröhre.) [**Megaoesophagus in Chagas's Disease. Quantitative Researches on the Intramural Nerve System of the Oesophagus**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1959, Nov., v. 10, No. 3, 291–5, 1 fig. [17 refs.]

This was carried out in 5 controls and in 10 autopsy specimens of Chagas's disease with high-grade megaoesophagus. After fixation with formalin in the upper, middle and lower thirds (3 cm. above the cardia), cross sections (5 mm. in breadth) were made. Each of these rings was embedded in paraffin and the series of sections, 150 in number, were made, of 7 μ in thickness. Out of each block some 20 were counted, representing about 1 mm. of the oesophageal ring, and the ganglion cells were included. In a pictorial table the results are given.

In the controls, in the upper third 429, in the middle third 795 and in the lower third 1,037 ganglia cells were counted. Therefore the number of these increased from upwards downwards. In Chagas megaoesophagus the figures were: 0·8, 2·8 and 5·7 respectively. In the upper section the damage was complete, but in the lower third 30 ganglia cells were intact.

In spite of these findings it is probable that the amount of damage is about the same all through, because in the normal oesophagus the percentage is greatest in the lowest third. Not only is there great dilatation, but there is also *aperistalsis*. In course of time a *circulus vitiosus* is brought about by a process of hypertrophy and dilatation resulting in maximal disturbance of the oesophagus which is now known as megaoesophagus.

[The illustration demonstrates a megaoesophagus in gross section over 5 cm. in diameter compared with the normal 1 cm.] *Philip Manson-Bahr*

KÖBERLE, F. Chagas-Bronchiektasie. (Quantitative Untersuchungen am vegetativen Nervensystem des Respirationstraktes—Vorläufige Mitteilung.) [**Bronchiectasis in Chagas's Disease. Quantitative Study of the Vegetative Nervous System of the Respiratory Tract**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1959, Nov., v. 10, No. 3, 304–8, 4 figs.

In the course of investigations on the pathological anatomy of Chagas's disease a new form of bronchiectasis has been discovered and is figured with specimens from 2 men, 16 and 48 years old. There was also some indurative bronchopneumonia. Among 250 cases of chronic Chagas's disease at autopsy, there were 13 of bronchiectasis, and this forms part of the "new world in pathology" as enunciated by Chagas 50 years ago. The underlying mechanism of the pathology is similar to that already described for other "mega" syndromes.

In 3 control cases without Chagas's infection the number of ganglion cells in a section of the bronchial tree was estimated. There was an average of 251, but in similar preparations from 7 patients with Chagas's disease the number was reduced to between 5 and 65, giving an average number of 30 vegetative nerve cells in a segment of the main bronchus 1 mm. in length. Sections showed heavy parasitic infection of the bronchial musculature with leishmania forms. Probably neurotoxins are responsible for some of the damage. The onset is probably due to rupture of the pseudocysts and escape of the contained leishmania forms. Probably also the dissociation of the sympathetic from parasympathetic nerve fibres plays a part.

Philip Manson-Bahr

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, muco-cutaneous.

CHATTERJEE, A. N. & GHOSH, J. J. **Carbon Dioxide Assimilation by** *Leishmania donovani*. [Correspondence.] *Nature*. 1960, Jan. 30, v. 185, 322.

During a study of glucose metabolism by *Leishmania donovani* in buffered saline bicarbonate containing glucose it was observed that carbon dioxide was assimilated by the organisms. The conditions of experiment were as follows:—15 micromoles sodium bicarbonate (*p*H 7·3), 30 micromoles glucose, and 1 ml. of cell suspensions of the parasite containing 1·5–2·0 mgm. protein nitrogen were incubated in a total volume of 3 ml. in an atmosphere of 95% nitrogen and 5% carbon dioxide for 1 hour.

A table shows the carbon dioxide balance during that period, which was found to vary somewhat with the growth stage of culture used. It appeared that approximately 0·3 mole of CO_2 was incorporated per mole of glucose broken down, during which time 1·5 mole acids were produced, including succinic and malic acids.

In the presence of other substrates such as glycerol, ribose or pyruvate carbon dioxide fixation apparently did not occur. The authors think that the presence

of active transaminases in this parasite may be associated also with the marked carbon dioxide fixation.

The mechanism of the incorporation is being further studied. *J. D. Fulton*

FERRAND, M., ROUMAGNAC, H., PERNOD, J. & EHRHART, C. Le diagnostic precoce du kala-azar chez l'adulte. (A propos de onze cas.) [**Early Diagnosis of Kala Azar in Adults. Account of 11 Cases**] *Algérie Méd.* 1959, May, v. 63, No. 5, 533–7.

10 of these patients in Algeria were Europeans.

NUSSENZWEIG, V. Valor da reação de fixação do complemento para leishmaniose visceral com antígeno extraído de bacilos de tuberculose. II. Relação entre a reatividade do sôro e os dados clínicos. [**Value of the Complement-Fixation Reaction with a Tubercle Bacillus Antigen in Visceral Leishmaniasis. II. Relation between the Serological Reactions and Clinical Data**] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1958, July, v. 10, No. 3, 251–8. English summary. III. Variação da reatividade sérica com o tratamento específico. [**III. Variation in the Serological Reaction during Specific Treatment**] *Ibid.*, 259–66. [20 refs.] English summary. IV. Inibição da reação por excesso de sôro. [**IV. Inhibition of the Reaction in the Presence of an Excess of Serum**] *Ibid.*, 267–74. [18 refs.] English summary.

II. A careful analysis was made of the results of applying the complement-fixation test to untreated patients with kala azar coming from the state of Ceará, Brazil. There was a gradual rise in titre during the course of the disease, from 1 in 68 early in the infection to 1 in 461 after 6 months, but this increase was inconspicuous in children under 3 years of age. High titres ran parallel with the degree of splenomegaly (1 in 216 with smaller spleens, up to 1 in 409 with the larger) and of enlargement of the liver (1 in 202 with smaller livers, up to 1 in 574 with the larger).

III. The sera of patients suffering from kala azar in the state of Ceará were tested by the complement-fixation reaction, before, during, and after treatment. 82 patients were treated with glucantime; 25 patients received solustibosan also. In general, the titre fell from about 1 in 250 to half this figure or less, after the completion of treatment. Cases which do not respond to treatment continue to show strongly positive reactions and repetition of the test at intervals for 3 to 6 months after the completion of treatment is recommended in order to confirm its efficacy.

IV. The zone phenomenon was observed in the serum of 13 patients with visceral leishmaniasis. This occurred in the tubes of low dilution, and inhibition of the reaction could be prevented either by diluting the serum or by increasing the concentration of antigen. In most cases this phenomenon was seen in patients with strongly positive sera, but it often persisted after treatment when the reaction was less intense, and for this reason it is thought that two types of antibodies may sometimes be present in the sera, one of which fixes complement, and the other which blocks the reaction.

P. C. C. Garnham

DURAND-DELACRE, R. Phlébotomes de Tlemcen (Algérie). [*Phlebotomus* **Species in Tlemcen, Algeria**] *Arch. Inst. Pasteur d'Algérie.* 1959, Dec., v. 37, No. 4, 594–7.

Phlebotomus perniciosus, *P. longicuspis*, *P. sergenti*, *P. perfiliewi* and *P. minutus* var. *parroti* were found. None were shown to be vectors of Oriental sore.

GUTIÉRREZ BALLESTEROS, E. Leishmaniasis tegumentaria. Primer caso con invasión de la mucosa, diagnosticado en México. [**First Case of Cutaneous Leishmaniasis with Invasion of Mucosa diagnosed in Mexico**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1959, June, v. 19, No. 2, 129–34, 4 figs. English summary (7 lines).

FEVERS OF THE TYPHUS GROUP

In this section abstracts are arranged as far as possible in the following order:—general; louse-borne typhus, flea-borne typhus, mite-borne typhus; rickettsialpox; tick-borne typhus; Q fever, other rickettsial diseases.

ARCH. INST. PASTEUR DE TUNIS. 1959, Dec., v. 36, Nos. 3/4, 265–610, illustrated. [Numerous refs.] Cinquantenaire des découvertes de Charles Nicolle sur le typhus exanthématique. [**Fiftieth Anniversary of the Discoveries by Charles Nicolle on Epidemic Typhus**]

This special number of the *Archives* commemorates the fiftieth anniversary of the discovery by Charles NICOLLE of the transmission of epidemic typhus by the body louse, and it recalls that he received a Nobel prize in 1928 for his contribution to medical research.

In addition to an appreciative preface by G. RENOUX on Nicolle and the significance of his studies, the journal contains 27 papers (2 more will appear in a later issue) specially contributed by experts in particular fields of typhus research, with whose work readers of this *Bulletin* will be familiar. In the space available it is not possible to do more than make a briefest reference to each.

The papers are grouped in 4 main categories: (1) general, history and biology of rickettsiae, (2) epidemic and murine typhus, their epidemiology, vectors, prevention and treatment, (3) Q fever, (4) other rickettsiae and neo-rickettsiae.

In group (1) G. NEUJEAN (pp. 275–288) discusses the general question of the control of infectious diseases in terms of host-parasite equilibrium. Hélène SPARROW (pp. 289–299) describes the history of the "Rabta" strain of epidemic typhus, isolated by Nicolle in April 1924, which in August 1959 was in its 1,072nd guineapig passage. H. MOOSER (pp. 301–306) in a paper entitled "*Rickettsia typhi* (Wolbach and Todd 1920) Philip 1943, a synonym of *Rickettsia prowazeki* Rocha Lima 1916" criticizes the continued use of the name *R. typhi* for the agent of murine typhus. Ed. SERGENT (pp. 307–309)

gives a short historical note on the louse as a transmitter of human disease: "*la découverte du rôle du pou en pathologie humaine est une victoire française*". H. S. FULLER (pp. 311–338) discusses at some length the biological properties of pathogenic rickettsiae, with considerable reference to the literature and considers that the view is still supported that they occupy an intermediate position between bacteria and the larger viruses. C. L. WISSEMAN, Jr., J. GLAZIER and Martha J. GRIEVES (pp. 339–360) describe *in vitro* studies of phagocytosis and opsonization of typhus rickettsiae and methods for titrating opsonizing antibody.

Group (2) opens with a historical review by E. H. DERRICK (pp. 361–377) on classic and murine typhus in Australia. Epidemic typhus in Poland since the Second World War is discussed by J. KOSTRZEWSKI and E. WOJCIECHOWSKI (pp. 379–395). From 3,518 cases in 1946, the number has fallen, with fluctuations, to 287 in 1958. Two cases of Brill's disease in Czechoslovakia are described by Margita STOLZOVA'-SUTORISOVA, J. CERVENKA, V. KRIZAN and T. SIVA'K (pp. 397–400) and the present position of epidemic typhus in Rumania by D. COMBIESCO, G. ZARNEA, I. BUZDUGAN and Honorine IONESCO (pp. 401–409). In 11 districts studied it was found that 70% of cases were sporadic. F. WEYER (pp. 411–428) discusses some of his well-known studies and more recent experiments on the life span of rickettsiae in the faeces of lice. Viability may vary and it depends to some extent on species or strain factor, in addition to temperature, humidity and some unknown factors. Viability of rickettsiae of murine typhus in the excreta of *Xenopsylla cheopis* is the subject of a paper by G. BLANC (pp. 429–434) who extends his previous experiments. Anna HERZIG-WEIGL and S. KRYNSKI (pp. 435–439) describe experiments on the influence of temperature on the development of typhus infection in lice. They were able to show that *R. prowazeki* will multiply at a temperature of at least 18°C. J. JADIN (pp. 441–444) found that *R. prowazeki* could survive in sarcocysts taken from an okapi. G. CIACCIO and P. GIROUD (pp. 445–447) describe briefly experimental studies of infection of fish with rickettsiae.

J. P. FOX, J. A. MONTOYA, Martha E. JORDAN, J. R. CORNEJO UBILLUS, J. L. GARCIA, M. A. ESTRADA and H. M. GELFAND (pp. 449–479) review their well-known work on immunization of man against epidemic typhus with the avirulent strain E of *R. prowazeki*. Their observations in the Peruvian Andes have been extended to 3½ years. While immediate and delayed, but tolerable, reaction occurred, sero-response was induced in some 95% of non-immune vaccinated persons. Clinical cases were, however, few even in the unvaccinated and it is concluded that most infections in that area are subclinical. J. E. SMADEL, Elizabeth B. JACKSON and Janis M. CAMPBELL (pp. 481–499) write authoritatively on the current position of epidemic typhus vaccine and describe recent experiments on an alternative procedure for assaying potency and on methods for obtaining dry concentrated killed vaccines suitable for prolonged storage. P. ZDRODOWSKI (pp. 501–505) discusses shortly the question of vaccination against epidemic typhus and as a result of comparative studies with Strain E in guineapigs is optimistic as to its possibilities.

T. E. WOODWARD (pp. 507–519) reviews the treatment of rickettsial diseases with antibiotics and their spectacular efficacy, and briefly discusses chemoprophylaxis. In practice combined vaccine and chemotherapy is largely of academic interest, since both are valuable in their respective spheres.

Group (3) contains 4 papers on Q fever. E. H. LENNETTE (pp. 521–527) gives a brief review of the epidemiology; R. M. TAYLOR, J. R. KINGSTON and Farag RIZK (pp. 529–556) extend previous studies on Q fever in Egypt and the Sudan and conclude that as a result of childhood infections the disease is "silent" among people later in life in the areas of the Nile Delta studied. D. B. LACKMAN, J. F. BELL, C. L. LARSON, Mary L. CASEY and W. W. BENSON (pp. 557–569) describe the preparation and use in man of an intradermal sensitivity test and recommend its further use, preferably with serological tests, to demonstrate its specificity more clearly. Because of severe reactions met with in persons sensitive to Q fever vaccine, the intradermal test is regarded as an essential prelude to immunization with such a vaccine. Q fever in Israel is reviewed briefly by J. VAN DER HOEDEN and Z. EVENCHIK (pp. 571–575).

In the last group R. BABUDIERI (pp. 577–583) describes studies on *R. sennetsui* considered by Japanese workers to be the causative agent of infective mononucleosis. While it produced changes resembling that disease in laboratory animals the serologically negative results obtained with its use in European and American convalescents did not allow the author to confirm that it is the aetiological agent of infectious mononucleosis, at any rate in Italy; possibly the Japanese cases of this disease had a different aetiology. C. VAGO (pp. 585–593) discusses the "blue rickettsioses" in a coleoptera. C. B. PHILIP (pp. 595–603) compares rickettsia-like agents of disease in dogs in the western United States and in the Old World. Finally, P. GIROUD, P. LE GAC and N. DUMAS (pp. 605–610) found in serological studies of 540 patients with several ocular diseases other than trachoma that 192 were positive with antigens either of the major rickettsiae or of the neo-rickettsiae. *H. J. O'D. Burke-Gaffney*

LIGANOVA, Z. A. **A Study of the Rickettsiocidal and Insecticidal Properties of Hexylresorcinol.** *J. Microbiol., Epidemiol. & Immunobiol.* London. 1959, v. 30, No. 2, 165–8. [Translated from Russian.]

Hexylresorcinol is regarded as a good disinfectant where bacteria and viruses are concerned, but information about its action on rickettsiae is lacking. Accordingly lice infected with *Rickettsia prowazeki* were first treated with 0·5% formalin for 5–7 minutes to destroy superficial micro-organisms, washed and then triturated in a mortar with a solution of hexylresorcinol, either 0·03 or 0·1%: 5 minutes later blood was added and the mixture was "injected under the epidermomembrane of a feeding chamber" in which there were 700–1,000 louse larvae. None of these became infected within 20 days. There was a control series [which presumably did show infection, although this is not actually stated] in which the same proceeding was followed, saline being substituted for hexylresorcinol solution.

On the other hand, immersion of infected lice in the solution, even for 24 hours, did not destroy rickettsiae within them: survival was proved by the same technique of trituration and feeding to larvae. Nor does immersion in the solution kill the lice, but a 0·3% solution killed their ova in 30 minutes, and 0·03% solution killed a percentage in longer periods.

Finally a soap-solvent-DDT-hexylresorcinol paste is recommended for the combined purpose of killing lice, ova and rickettsiae. *L. P. Garrod*

JUILLAN, M. Recherche de la réaction de Weil-Felix chez 100 chiens de la région d'Alger. [**The Weil-Felix Reaction in 100 Dogs in the Algiers Area**] *Arch. Inst. Pasteur d'Algérie*. 1959, Dec., v. 37, No. 4, 566–7.

The reaction was negative in all cases.
[See also this *Bulletin*, 1959, v. 56, 601.]

ROGER, F. & ROGER, A. Intérêt du hamster pour l'élimination d'un contaminant péripneumonique dans le groupe des rickettsiales. [**Importance of Hamsters for the Elimination of a Contaminant of the Pleuropneumonia Group in Rickettsiales Cultures**] *Ann. Inst. Pasteur*. 1960, Jan., v. 98, No. 1, 151–3.

The authors report that contamination of *Rickettsia mooseri* or ornithosis virus by a member of the pleuropneumonia group when in passage in mouse lung, can be eliminated by a single intranasal passage in the hamster.

S. P. Bedson

GIROUD, P., CIACCIO, G. & DUMAS, N. Influence de la cortisone sur les réactions locales et générales. Cas de l'antigène du groupe boutonneux pourpré. [**Influence of Cortisone on Local and General Reactions. Tests with *Rickettsia conori* Antigen**] *Bull. Soc. Path. Exot.* 1959, Sept.–Oct., v. 52, No. 5, 568–71.

The effects of intracutaneous inoculation of preparations of *Rickettsia conori* in rabbits treated with cortisone varied considerably, 7 animals showing negative, weak or delayed local reactions and 2 dying in 3–7 days. The sera of animals which had received cortisone either gave negative results in agglutination tests with *R. conori* (3 out of 9) or had significantly lower titres than were found in sera from controls. When a patient's serum is being studied, it should therefore be known whether he has received cortisone, also whether any antirickettsial antibiotic has been given. *R. S. F. Hennessey*

HOLLAND, W. W., ROWSON, K. E. K., TAYLOR, C. E. D., ALLEN, A. B., FFRENCH-CONSTANT, M. & SMELT, C. M. C. **Q Fever in the R.A.F. in Great Britain in 1958.** *Brit. Med. J.* 1960, Feb. 6, 387–90.

Acute respiratory disease in the Royal Air Force in Great Britain has been investigated in recent years in conjunction with the Central Public Health Laboratory at Colindale, London [*Bull. Hyg.*, 1959, v. 34, 17, 858]. This partnership has led to the unmasking of 2 localized outbreaks of Q fever, one in a big Coastal Command station in Cornwall during March 1958, the second in a small officers' training unit in the Isle of Man during March and April of the same year. These two outbreaks appear to have been independent of one another.

Diagnosis was based on the demonstration of a rising titre of complement-fixing antibodies in paired sera obtained during the acute phase and in convalescence: a titre of 1 in 64 or above was considered diagnostic, while in asymptomatic persons 1 in 16 was deemed to indicate past infection.

The Cornish epidemic appeared to have originated in a patient, Sergeant R., who was admitted to the sick quarters on 8th March with high fever, cough, headache, abdominal pain and anorexia; his illness lasted for 6 days. Between 22nd and 24th March 4 members of the sick-quarters staff developed a similar illness, and on 29th March the last patient, Sergeant D., was admitted with an identical syndrome. Sergeant D. has visited Sergeant R. in hospital on 13th March.

In an attempt to trace the source of infection all personnel admitted to the sick quarters during the 4 weeks before 8th March and for a similar period after 29th March were examined for antibodies to *Rickettsia burneti*, but no significant titres were found. Similarly negative findings were recorded among the rest of the sick-quarters staff and in a random survey covering some 4% of the total strength of the station, with the exception of one doubtful specimen which showed a titre of 1 in 8. Further negative findings resulted from an examination of milk, packings, wool and dust from or recently introduced into the sick quarters, and the crew of an aircraft which had recently arrived from Cyprus (a highly endemic focus) was also eliminated as the source of infection. By exclusion it seemed evident that Sergeant R., who lived at a distance from the air station and had visited several neighbouring farms, had picked up the infection in the countryside and directly infected the sick-quarters attendants and Sergeant D. who visited him.

The second epidemic was less well defined. It occurred among the permanent personnel and in one of the two squadrons of officer cadets under training at an establishment in the Isle of Man. The illness first appeared among the permanent staff during the last week of March 1958 and continued until 12th April: cases among the officer cadets began during their Easter leave at the beginning of April. Out of 4 cadets admitted to sick quarters with an influenza-like illness, in 3 patients paired serum showed a 4-fold or greater rise in titre of *R. burneti* antibody. Sera collected during the next 3 months from 80% of the cadet strength of this squadron showed a significant titre of 1 in 16 or more in 17, and an insignificant titre of 1 in 8 or less in 19.

Among 34 members of the permanent staff in particular association with the affected officer cadet squadron, 9 showed antibody at significant titres while the remainder gave no clear evidence of past infection. The daughter of one infected member of the staff showed immunity 6 weeks after her father's illness, and the station chaplain's wife appeared also to have been infected during the epidemic period.

The usual incubation period of 14–25 days appears to have precluded the possibility of case-to-case infection but a common source of origin may have been provided by some sheds situated on a shooting-range near a farm. These sheds may have harboured stray parturient sheep before an expedition to clean them which was organized 17 days before the onset of the epidemic and in which all the people who were later infected had been directly or indirectly involved.

A widespread enquiry was carried out in 20 RAF stations throughout Great Britain in an effort to recognize Q fever among cases of "short term fever" during March and April 1958. Only 2 isolated examples were revealed.

J. H. Walters

SYRUCEK, L. **Q Fever in North-West Bohemia 1954–1958.** *J. Hyg., Epidemiol., Microbiol. & Immunol.* Prague. 1959, v. 3, No. 4, 465–71. [22 refs.]

See this *Bulletin*, 1960, v. 57, 25.

MODICA, R. La presenza della febbre "Q" in Tripolitania. [**Review of Q Fever in Tripolitania**] *Boll. Sanitario d. Tripolitania.* 1959, Oct.–Dec., 45–6. English summary (7 lines).

Between 1954 and 1956, 3,390 specimens of serum from persons in Tripolitania were tested for complement-fixing antibodies against the Henzerling strain of *Rickettsia burneti*. Positive results in titres of 1/16 to 1/128 were found in 513 (15·1%). 2 persons with symptoms showed a rise in antibody titre. 50% of positive results were also found in "a limited number" of goats and sheep tested.

[See this *Bulletin*, 1952, v. 49, 613.] *H. J. O'D. Burke-Gaffney*

CARVALHO DE SOUZA, J. R., FRANCO, A. P. & PINTO, M. R. Variation de phase antigénique de la *Coxiella burnetii* dans des cultures de tissus. [**Variation of Antigenic Phase of *Rickettsia burneti* in Tissue Culture**] *C.R. Soc. Biol.* 1959, v. 153, No. 10, 1673–6.

A strain (NM) of *Rickettsia burneti* which behaved antigenically as phase II after 30 passages in chick embryos was exposed to increasing concentrations of serum with a high titre of anti-phase II complement-fixing antibody during passage in chick and mouse embryo tissue culture systems. Antigens prepared from these cultures at the 4th passage reacted positively in complement-fixation tests with antibodies for phase I antigens and did not react with antibodies for phase II antigens, from which it was concluded that the strain had reverted to phase I. *R. S. F. Hennessey*

ROSENBERG, M. & KORDOVÁ, N. **Study of Intracellular Forms of *Coxiella burneti* in the Electron Microscope.** *Acta Virologica.* Prague. 1960, Jan., v. 4, No. 1, 52–5, 6 figs. on 3 pls. [19 refs.]

This is an account of electron microscope studies of tissue cultures of yolk sac membranes infected with *Rickettsia burneti* (Nine Mile strain). No bodies resembling rickettsiae were seen during the first 48 hours after infection. Clearly defined bodies "measuring several μ" without an outer membrane were regularly present in the cytoplasm of tissue cells after 48 hours, some of these bodies ("matrices") appearing as compact electron-dense matter (sometimes vacuolated) and others as aggregates of fine-grained homogeneous particles. Typical "elementary bodies" of *R. burneti* (300–600 mμ) were detected 4 to 6 days after infection, together with rounded or oval bodies (300–1,200 mμ) which showed an outer membrane ("intermediate" forms); the electron-dense centres of some intermediate forms appeared to have undergone segmentation. These diverse formations occurred together in localized foci, and the authors consider that they provide evidence that *R. burneti* reproduces by a process which resembles that of large viruses.

R. S. F. Hennessey

KORDOVÁ, N. **Study of Antigenicity and Immunogenicity of Filterable Particles of** *Coxiella burneti*. *Acta Virologica*. Prague. 1960, Jan., v. 4, No. 1, 56–62. [15 refs.]

Yolk sac preparations from eggs in which filtrates (through membranes of 79 mμ mean porosity) of *Rickettsia burneti* suspensions had been passaged twice gave negative complement-fixation reactions with immune sera although having an ID50 for chick embryos at a dilution of over 10^{-10} but showing no morphologically typical *R. burneti*. Positive reactions were obtained with preparations from the 3rd and subsequent egg passages, in which morphologically typical *R. burneti* were present. Guineapigs inoculated 3 times at weekly intervals with filtrates inactivated with formaldehyde and phenol failed to develop complement-fixing antibodies. Similar inoculations of inactivated egg passage material from the first 2 passages of filtrate induced low titres (1 in 8) of antibodies in some guineapigs, maximum titres (1 in 64 to 1 in 128) occurring in animals which received material from the 4th or 5th egg passage. It is suggested that antigenicity may be correlated with the presence of morphologically "mature" *R. burneti* in preparations used for immunization.

R. S. F. Hennessey

KORDOVÁ, N. & REHÁCEK, J. **Experimental Infection of Ticks** *in vivo* **and their Organs** *in vitro* **with Filterable Particles of** *Coxiella burneti*. *Acta Virologica*. Prague. 1959, Oct., v. 3, No. 4, 201–9, 6 figs. on 3 pls. [20 refs.]

Previous work showed that ultrafiltrates of yolk sac preparations of *Rickettsia burneti* contained infective material [this *Bulletin*, 1959, v. 56, 710]. In experiments now described, filtrates of *R. burneti* suspensions (Nine Mile and Henzerling strains) through membranes of 60 and 40 mμ mean porosity regularly gave rise to intracellular elementary particles regarded as typical of *R. burneti* when inoculated into the coelom of ticks (*Ixodes ricinus, Dermacentor marginatus* and *Haemaphysalis inermis*), these particles appearing in cells of the gut, ovaries, fat body and hypodermis from the 8th to the 18th day after inoculation. Suspensions of ticks which received filtrates were inoculated into chick embryo yolk sacs, and a massive proliferation of microscopically typical *R. burneti* became evident after 3 blind passages; a proportion of mice and guineapigs inoculated with tick suspensions developed antibodies for *R. burneti*. Morphological changes observed in the cells of inoculated ticks resembled those seen in yolk sac cells and in the splenic cells of hamsters which had been injected with filtrates but which had not formed antibodies; typical *R. burneti* were found in ticks inoculated with splenic material from the hamsters.

It is concluded that ticks and yolk sacs are suitable substrates for the cultivation and detection of filterable particles of *R. burneti*.

R. S. F. Hennessey

STOENNER, H. G. & LACKMAN, D. B. **The Biologic Properties of** *Coxiella burnetii* **isolated from Rodents collected in Utah.** *Amer. J. Hyg.* 1960, Jan., v. 71, No. 1, 45–51. [13 refs.]

The 5 strains of *Rickettsia burneti* with which this paper deals were recovered from *Peromyscus maniculatus, Dipodomys ordii* and *D. microps*

collected in the Great Salt Lake desert and are the first to be isolated from wild mammals in the United States. When compared with a strain isolated from ticks (*Dermacentor parumapertus*) collected in the same area and 2 strains (1 from cattle, 1 from man) isolated in Idaho, the rodent strains were much more infective (30 to 300 times) for hamsters than for guineapigs or mice, induced greater antibody responses in hamsters than in the latter hosts, and rarely produced fever in guineapigs when given in doses 10^4 to 10^6 times the hamster ID50. The authors remark that "if these strains are typical of those resident in wild mammals, the hamster obviously is the animal of choice for their isolation". *R. S. F. Hennessey*

Blanc, G., Ascione, L. & Bésiat, Paulette. Rickettsiémie expérimentale de *Testudo mauritanica* avec *R. burneti* et infection de la tique *Hyalomma aegyptium*. [**Experimental Rickettsiaemia in Tortoises** (*Testudo mauritanica*) **by Inoculation with** *R. burneti* **and Infection of the Tick** *Hyalomma aegyptium*] *Bull. Soc. Path. Exot.* 1959, Sept.–Oct., v. 52, No. 5, 564–7, 3 figs. (2 on 2 pls.)

This paper reports the recovery of *Rickettsia burneti* from *Hyalomma aegyptium* which had fed on tortoises (*Testudo mauritanica*) inoculated intracardially or intra-abdominally with the rickettsiae. The duration of rickettsiaemia in tortoises is stated to be generally short, but no details are given. Agglutination tests with sera of inoculated tortoises have so far been negative. *R. S. F. Hennessey*

YELLOW FEVER

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.

Kerr, J. A., Roca-Garcia, M. & Bugher, J. C. **Naturally Acquired Yellow Fever Immunity in Muzo, Colombia.** *Amer. J. Trop. Med. & Hyg.* 1960, Jan., v. 9, No. 1, 18–28, 2 figs.

In the past the County of Muzo, in the State of Boyacá, Columbia, had frequently been the scene of sharp outbreaks of an acutely fatal disease. For many years yellow fever had been suspected as the cause, but since *Aëdes aegypti* was never found, the diagnosis of yellow fever could not be finally accepted [this *Bulletin*, 1944, v. 41, 210]. With the development of the mouse protection test in 1931, however, it was possible to obtain confirmatory information. Thus, from the application of this test to 88 specimens of human blood from persons resident in Muzo, Kerr and Patiño Camargo (*Rev. de Higiene*, Bogota, 1933, v. 2, 63) showed 47% to contain neutralizing antibodies to yellow fever and thereby concluded that yellow fever had been present in Muzo in recent years.

The studies reported in the present article were begun in Muzo in 1936 in order to determine the prevalence in the human population of immunity to yellow fever (as measured by the mouse protection test) and its distribution

by age, sex and length of residence before the use of any yellow fever vaccine in the study area. A first collection of blood specimens from as many as possible of the 4,965 inhabitants was made between February 1936 and May 1937, and of this first bleeding satisfactory neutralization test results were obtained on 2,129 sera. A second bleeding was done between July 1937 and July 1938 of donors of first bleeding specimens, in order to obtain evidence of serological conversions to yellow fever during the intervening period, and of these second bleeding specimens satisfactory test results were obtained on 1,462 sera. Immediately after the second blood specimen was taken, the donors and their families were immunized against yellow fever with the then newly available 17D vaccine.

Results of the neutralization tests on specimens of the first bleeding showed that among 1,479 persons, born in Muzo and life-long resident there, the proportion of positives for yellow fever antibody was 34·6%: among 708 males 37·8% and among 771 females 31·6%. The rates for females were consistently lower than for males in all age-groups over 0–4 years. In both sexes the proportion of positives increased rapidly with age up to 30 years and thereafter remained fairly constant at about 70% in the males and 60% in the females. As with age, so with length of residence: for persons born outside the County, the longer they lived in Muzo, the higher the proportion with antibody to yellow fever. Results of tests on serum specimens obtained from the second bleeding done on 1,462 of the original donors showed the net conversion rates (conversions less reconversions) to be 12·8% for males and 6·7% for females, the rates being highest in adult males.

The results of these studies in their relation to the jungle yellow fever situation in Muzo are then discussed. The fact that females had a lower percentage of positive sera than males in all age-groups, except 0–4 years, is consistent with a somewhat less intimate contact with the virus on the part of the females. While this would be readily understandable if the principal habitat of the virus were in the forest, the small differences between the positive rates for males and females make it necessary to consider the possibility that much of the contact took place outside the forest. Such contact was shown to have begun early in life: in the age-group 10–14 years, for example, 21·5% of all males and 14·7% of all females were positive. As regards the results obtained from the second bleeding, it would appear that variations in the incidence of yellow fever from one locality to another were much more important in determining rate of conversion than the time interval between the two bleedings. Although, in the authors' view, these results establish the fact that jungle yellow fever is present in Muzo much of the time, they do not indicate whether the virus is constantly present in the County or whether it invades the County from time to time.

As regards transmission of the virus in Muzo, *Haemagogus* mosquitoes have been taken biting human beings outside and even inside houses well away from the forest. Transmission directly from man to man outside the jungle and even inside houses appears, therefore, to be possible. As to mammalian hosts of the virus: there are no wild primates in Muzo, but primates of 4 different species abound between Muzo and the Magdalena River area. [According to Bugher (quoted in *Yellow Fever* [edited by Strode], 1951, New York: McGraw-Hill, p. 481; this *Bulletin*, 1952, v. 49, 337) the only animals susceptible to yellow fever virus and which are present in large numbers in Muzo

are the marsupials, *Didelphis marsupialis* and *Metachirus nudicaudatus*. The only other susceptible animal of the region is also the only primate—man himself. It seems likely that the human population plays a part in the epidemiology, with some assistance from the marsupials.] *G. Stuart*

COLLIER, W. A., DE ROEVER-BONNET, H. & HOEKSTRA, J. Ueber Virulenz und Virulenz-Curven. [**Virulence and Virulence Curves**] *Antonie van Leeuwenhoek: J. Microbiol. & Serol.* 1959, v. 25, No. 2, 113–36, 13 graphs. [15 refs.]

The authors propose a method for the graphic recording of the virulence of a virus, in which the LD50 in a conventional serial decimal dilution titration is calculated each day until the attainment of the maximum value and then plotted against time. The incubation period before the occurrence of the first deaths, the slope of the rising part of the curve and the maximum can then be used as criteria of virulence. A number of experimental curves obtained with the 17D and Asibi strains of yellow fever virus are given in illustration of the method [see also this *Bulletin*, 1959, v. 56, 1122]. *D. J. Bauer*

SURTEES, G. **The Breeding Behaviour of the Type Form of *Aëdes* (*Stegomyia*) *aegypti* (L.) in South-Western Nigeria in relation to Insecticidal Control.** *Bull. Entom. Res.* 1960, Jan., v. 50, Pt. 4, 681–6. [15 refs.]

In south-western Nigeria the type form of *Aëdes aegypti* is one of the most widespread of mosquitoes. The larvae occur in tree-holes in the coastal mangrove swamps and around Lagos, but are restricted to domestic container habitats in the rain-forest area. [The author states that "*A. aegypti* . . . was represented throughout by the type form". Examination of 138 adults from one of the author's localities however shows 79% sub-species *formosus*.]

Larval surveys in Lagos and in a forest village, with earthenware pots as test containers, revealed a higher index inside houses than in more exposed situations. The relative difference between incidence inside houses and that in exposed situations was greater in the forest village (54%:14%) than in Lagos (40%:24%). The less markedly domestic pattern in Lagos was attributed to the lack of water storage in houses because of the piped water supply. Larvae in Lagos appeared to tolerate a greater degree of vegetable contamination in their water than those in the forest village.

Spraying tests carried out in the forest village included aerial application of DDT at 0·5 lb. of a 5% solution per acre and ground fogging with 0·8 oz. of a 15% solution of dieldrin per acre. The ground fogging gave the highest mortality but in both tests larvae protected by vegetation suffered as little as 50% mortality in the 24 hours after application. Fogging inside individual rooms gave up to 100% mortality of larvae inside houses, but such larvae were probably unaffected by the aerial spraying (mortality 2%).

It is concluded that the best method of control would be by the individual treatment of potential breeding sites, immediately before the rains, with larvicidal pellets of plaster of Paris with BHC [this *Bulletin*, 1956, v. 53, 505]. The theoretical implications of such a control method are briefly discussed with relevance to *A. aegypti*. *G. A. H. McClelland*

MEERS, P. D. **The Desiccation of Yellow Fever Vaccine in a Modified Centrifugal Drying Plant.** *West African Med. J.* 1960, Feb., v. 9 (n.s.), No. 1, 29–32.

In the case of 17D yellow fever vaccine, the loss of virus titre during the process of freeze-drying by the centrifugal technique is particularly high. At the Yaba laboratory, for example, records showed, with respect to 30 consecutively produced batches of that vaccine, the average pre-desiccation titre to have been 303,000 LD50 per ml., as compared with an average post-desiccation titre of 101,000 LD50 per ml., the loss of titre in routine centrifugal drying having been, therefore, 67%.

In the present paper the author shows how that loss was greatly reduced as a result of simple modifications carried out on the centrifugal drying plant at Yaba. These modifications, described in detail in the text, permitted the following procedure for freeze-drying: ampoules containing the virus suspension were "snap" shell frozen by immersion in a bath of alcohol at −60°C.; they were then transferred to the refrigerated chamber at a temperature of −10° to −20°C. and the lid was placed in position; the vacuum pump was switched on, and the drying chamber refrigerator switched off about half an hour later, the temperature of the chamber rising slowly to about 22°C.; this primary desiccation was continued for 18 hours. Thereafter drying was completed on the secondary drying machine, over phosphorus pentoxide, for a further 5 hours, and the ampoules, after having been back-filled with dry nitrogen, were sealed.

For an experimental comparison of the effect on virus titre of drying by the routine centrifugal method and by the author's modified method, respectively, 10 batches of virus suspensions were prepared, each suspension being ampouled at once and the ampoules divided into 2 groups: group A—primary desiccation by the centrifugal method and group B—primary desiccation by the modified method. In both cases drying was completed over phosphorus pentoxide. Titrations of the pre-desiccation virus suspensions and of the resulting desiccates (reconstituted to their pre-desiccation volumes) were carried out by the intracerebral inoculation of white mice with serial 10-fold dilutions of the material under test, the 50% endpoint being calculated according to the method of REED and MUENCH.

Results showed the average titre, in LD50 per ml., of the pre-desiccation virus suspensions to be 549,300; of the group A ampoules to be 205,500 and of the group B ampoules 438,600, the loss of titre in the "A" ampoules being, therefore, 62% and in the "B" ampoules 20%. *G. Stuart*

DENGUE AND ALLIED FEVERS

THEILER, M., CASALS, J. & MOUTOUSSES, C. **Etiology of the 1927–28 Epidemic of Dengue in Greece.** *Proc. Soc. Exper. Biol. & Med.* 1960, Jan., v. 103, No. 1, 244–6. [11 refs.]

In 1927–28 an epidemic of "dengue" involving over 1 million cases occurred in Greece. In 1958 27 sera were obtained from Athenians aged over 32 years, and 29 sera from younger residents. They were tested for haemagglutinin-inhibiting antibody to West Nile, dengue-1, dengue-2, Japanese encephalitis

yellow fever, Russian spring-summer, and SAH336 (related to Uganda S) viruses. 17 of 27 sera from older residents had antibody to West Nile and dengue-1 compared with only 1 of the younger group. 8 sera had higher titres against dengue-1, 5 against West Nile. All the sera except one had its highest titre against either dengue-1 or West Nile—the exception had the highest titre against Russian spring-summer virus and was found to neutralize 300 LD50 of the virus—the patient had lived all his life in Greece.

17 sera without haemagglutinin-inhibiting antibody and 11 with it were tested for neutralizing antibody to West Nile and dengue, with 40 and 50 LD50 respectively. None of the negative sera neutralized either virus, but 10 of 11 positive sera neutralized dengue-1 virus, while none of them neutralized West Nile.

These results strongly suggest that the 1927–28 epidemic was due to dengue-1 and that group B arborvirus infections have been absent or uncommon since. They also suggest that naturally acquired haemagglutinin-inhibiting and neutralizing antibodies to dengue-1 virus persist for at least 30 years.

C. E. Gordon Smith

SIGEL, M. M. & BEASLEY, A. R. **Studies on Dengue Fever.** *Texas Reports on Biol. & Med.* 1959, v. 17, No. 4, 618–23.

An epidemic of dengue was reported in Miami, Florida, in 1934, but since then although *Aëdes aegypti* is present it is not known whether dengue occurs in the region.

Sera collected in South Florida in 1957–1958 in an influenza vaccination study were tested for haemagglutinin-inhibiting antibody against the Trinidad 1751 strain of dengue-2. 18 of 192 adults, 0 of 38 children and 2 of 19 sera received for laboratory diagnosis of other diseases had antibody. 5 of the positive sera were shown also to contain neutralizing antibody (indices 19–631). Only 4 of the positive persons (aged 41–53 years) had not left the United States or had been vaccinated against yellow fever. One of these stated that her parents had had dengue and another that he himself had had it.

St. Louis encephalitis infections were detected in South Florida in 1958. 2 subjects found positive for dengue, with haemagglutinin-inhibiting titres of 40 and 80 and neutralizing indices of 354 and 10, were therefore tested for St. Louis neutralizing antibody and none was found. Evidence is thus presented that infections with dengue or a related virus may have occurred in South Florida.

C. E. Gordon Smith

RABIES

CARIBBEAN MED. J. 1959, v. 21, Nos. 1/4, pp. viii + 238, illustrated. [Numerous refs.] **Paralytic Rabies transmitted by Bats in Trinidad.**

This issue of the *Caribbean Medical Journal* celebrates its 21st anniversary, appropriately, by devoting its pages to the history of paralytic rabies transmitted by bats in Trinidad and the events which led up to its discovery. It

is a tribute to the pioneers, of whom special mention is made of the late Dr. J. L. PAWAN, whose name will always be associated with these studies.

The monograph contains reproductions of the original papers, together with extracts from annual reports of the Surgeon General and of the Director of Agriculture and from the proceedings of the Agricultural Society of Trinidad and Tobago.

It opens with a history of the disease written by the editor-founder of the *Journal*, Dr. J. A. WATERMAN, now Deputy Director of Medical Services in Trinidad—who was himself the first to suggest that the condition was a new disease. This is followed by brief biographical notes, with portraits of 4 of the pioneer workers. There are then set out consecutively an editorial from *The Lancet* of 19th September, 1931, 10 papers and 5 appendices containing the extracts of reports referred to above from 1923 onwards.

In his introductory history [pp. 1–6] Dr. Waterman recalls that from 1925 a disease occurred among pasture animals which was diagnosed as botulism. In 1929 he diagnosed a case of acute ascending myelitis, several more cases followed and were diagnosed by others as poliomyelitis. Dr. Waterman believed that the disease in animals and man was the same and was neither botulism nor poliomyelitis. Eventually in 1931 Negri bodies were found in autopsy specimens of brain and the suggestion was made that a bat was the transmitting agent. This was confirmed in the same year and Negri bodies were found in the brain of a bat.

The first 2 of the reprinted papers are the classical studies of E. W. HURST and J. L. PAWAN [this *Bulletin*, 1932, v. 29, 187, 595]. Next is Waterman's paper (pp. 46–74) on acute ascending rabic myelitis which was a thesis for a doctorate in the University of Glasgow. There then follows an account of paralytic rabies in livestock by H. V. M. METIVIER, then Government Veterinary Surgeon [*ibid.*, 1936, v. 33, 743]. The study and control of paralytic rabies transmitted by bats, written by E. DE VERTEUIL and F. W. URICH is next reproduced [*ibid.*, 1936, v. 33, 742]. This is followed by 3 more papers by Pawan on transmission of rabies by the vampire bat, the clinical course in the bat and on paralysis as a clinical manifestation in human rabies, respectively [*ibid.*, 1936, v. 33, 742; 1937, v. 34, 677; 1939, v. 36, 726].

The last 2 papers bear no reference to their origins, but appear from the context to be original contributions and were evidently written since 1956. One, by L. V. BUTCHER [pp. 166–168], discusses the present status of the disease. It is noted at the time of writing that there have been 89 deaths from human rabies in Trinidad, the last in 1937, but the disease still occurs in cattle. Finally A. M. GREENHALL [pp. 169–171] presents a check list of the bats of Trinidad and Tobago.

This issue of the *Journal* gives an admirable summary of the history of paralytic rabies in Trinidad and reflects great credit, not only on the careful research work carried out there, but on those who initiated it and those who conceived this special anniversary number. *H. J. O'D. Burke-Gaffney*

BELL, J. F. & MOORE, G. J. **Rabies Virus isolated from Brown Fat of Naturally Infected Bats.** *Proc. Soc. Exper. Biol. & Med.* 1960, Jan., v. 103, No. 1, 140–42, 2 figs.

The probable role of brown fat in the pathogenesis of rabies has been discussed by SULKIN *et al.* [this *Bulletin*, 1960, v. 57, 29], who, *inter alia*,

adduced evidence from bats experimentally infected with rabies virus that this virus may be present in brown fat when absent from other organs, and that it may propagate in this tissue. In the present article the authors record the isolation of rabies virus from the brown fat of naturally infected bats.

Bats of the species *Myotis lucifugus* and *Eptesicus fuscus*, collected in western Montana, were kept under observation in indoor flight cages throughout their period of survival. At necropsy, brain, salivary glands and brown fat were removed for laboratory examination; these tissues were ground by mortar and pestle in 10% albumin-saline diluent at *p*H 7·5 to make 10% suspensions, of which 0·03 ml. amounts were injected intracerebrally into 21-day-old Swiss white mice. Results of tests on the tissues obtained (a) from 2 *Myotis* bats, which died, respectively, on the 10th and 11th day of captivity, and (b) from one *Eptesicus* bat, which died on the 30th day, may be summarized as follows.

(a) Rabies virus was isolated from the pooled brain and pooled brown fat of the 2 *Myotis* bats, after incubation periods in mice of 16 and 18 days, respectively; 5 of 6 mice became infected from brain tissue and 1 of 6 from brown fat; typical Negri bodies were found in mouse brains; virus was not isolated from the pooled salivary glands; histological examination of the bats' brains failed to reveal the presence of typical Negri bodies.

(b) Rabies virus was isolated from the brain, brown fat and salivary glands of the *Eptesicus* bat, after incubation periods of 9, 22 and 11 days, respectively; 1 of 6 mice injected with brown fat suspension and all mice injected with brain or salivary gland suspensions died of rabies; virus titres in brain and salivary glands were log 1·2 and 3·4/0·03 ml., respectively; histological examination revealed no pathognomonic changes in the bat's brain.

As regards these 3 bats, from which virus was recovered, none showed any signs of rabies during captivity and it would seem possible that their deaths were unrelated to rabies infection, inasmuch as other bats maintained under identical conditions also died but without infection; moreover doubt regarding infection as the cause of their deaths may also arise, because of the absence of encephalitic lesions in their brains.

Finally it is of interest to note that since this article was submitted for publication rabies virus has been isolated from brown fat in 5 more instances, including 3 from species not mentioned above: twice from *Lasionycteris noctivagans* and once from *Myotis evotis*. *G. Stuart*

LENNETTE, E. H., SOAVE, O. A., NAKAMURA, K. & KELLOGG, G. H., Jr. **A Fatal Human Case of Rabies following the Bite of a Rabid Bat (*Lasionycteris noctivagans*). Isolation and Identification of the Virus from Vector and Victim.** *J. Lab. & Clin. Med.* 1960, Jan., v. 55, No. 1, 89–93. [25 refs.]

Until 1959 there had been no direct evidence of natural transmission of rabies from insectivorous bats to man or lower animals. Circumstantial evidence had, it is true, incriminated bats of this category as the source of infection in 3 human rabies deaths—2 in the United States (both in Texas) and 1 in India [in Andhra State]—and experimentally infected insectivorous bats (*Myotis lucifugus*) had been shown by REAGAN *et al.* [this *Bulletin*, 1957,

v. 54, 813] to be capable of transmitting the virus to laboratory animals by bite. In 1959, however, the cause and effect relationship between the bite of naturally infected insectivorous bats and fatal rabies in man and laboratory animals was definitely established. In this connexion BELL [*ibid.*, 1959, v. 56, 1023] reported the transmission of rabies to suckling mice by the bite of a naturally infected bat, *Myotis californicus californicus*, while, in the present article, the authors record the first human case of bat rabies in which the biting episode was observed and the bat, made available for diagnosis, proved positive in laboratory tests.

This case of human rabies occurred in California in a 53-year-old woman, who had been bitten on the finger by a silver-haired bat, *Lasionycteris noctivagans*. Microscopic examination of the bat's brain having revealed the presence of Negri bodies, the patient received antirabies hyperimmune serum and a complete course of duck-embryo type vaccine (begun on the 4th day after exposure). Despite treatment the patient died of rabies some 2 months after the bites were inflicted. Rabies virus, which had been recovered earlier from the brain of the bat, was also isolated from the patient's central nervous system by the mouse inoculation test. That the infective agent recovered from the human brain was rabies virus was confirmed by specific serum-virus neutralization tests. *G. Stuart*

McLEAN, D. M., KRAUSE, V. W., WILSON, W. M. & HAWKE, W. A. **Rabies following Skunk Bite.** *Canadian Med. Ass. J.* 1960, Feb. 6, v. 82, No. 6, 315–17.

"A seven-year-old child living at Port Perry, Ontario, died of rabies almost six weeks after being bitten by a skunk. The presence of Negri bodies in the central nervous system and the isolation of rabies virus from brain, salivary glands and saliva confirmed that this child was infected with rabies virus."

UNITED STATES DEPT. HEALTH, EDUCATION, & WELFARE. **Rabies: Methods in Laboratory Diagnosis** [TIERKEL, E. S. & NEFF, Helen O.]. *Pub. Health Service Publication No. 568* (Reprinted Dec. 1957). pp. ii + 42, 27 figs. Wash. 25, D.C.: Superintendent of Documents, U.S. Govt. Printing Office. [$0.25.]

This booklet has been designed "as a practical guide for laboratory personnel, health workers, and veterinarians who are actively concerned with the diagnosis of rabies". It covers much of the field embodied in the first part of the WHO publication, *Laboratory Techniques in Rabies* [this *Bulletin*, 1954, v. 51, 1242], but has selected simple, dependable and economic techniques from the various methods available.

After a short general introduction, the booklet is divided into 4 parts. The first part deals with preparation and despatch of suspected tissues, and this includes removal of animal brain and salivary glands and a note on disposal of the remains. The second describes the procedures for examination for Negri bodies, including staining and identification. The third part gives full details

of the biological diagnostic test in mice, and includes observation of the mice and dissection of their brains. The last part sets out briefly how results should be reported.

There are 2 appendices: one gives the U.S. regulations covering transport of animal heads for laboratory examination and the other reproduces a specimen form for recording the animal history.

The techniques described are set out in detail step by step and in clear and simple language. Each procedure is preceded by a list of equipment required and the booklet is excellently illustrated by 27 very instructive photographs.

Those who require a thoroughly practical guide to the laboratory diagnosis of rabies will find this little book admirable. *H. J. O'D. Burke-Gaffney*

CANNON, D. A. **Rabies Vaccine Trials in Nigeria.** *West African Med. J.* 1960, Feb., v. 9 (n.s.), No. 1, 12–20, 2 diagrams.

In 2 series of experimental studies co-ordinated by WHO on the efficacy of antirabies vaccine and hyperimmune serum, groups of adult persons, previously unexposed to rabies and with no history of antirabies vaccination, had been inoculated with different schedules of phenolized inactivated vaccine, given subcutaneously, and of high egg passage (HEP) Flury strain vaccine, given intradermally, with and without inoculation of antirabies serum. Of the immunity conferred by these various forms of prophylaxis indirect evidence, based on the presence of serum antibody during or after treatment, was adduced by the results of neutralization tests on the sera of the treated persons [this *Bulletin*, 1956, v. 53, 1420; 1958, v. 55, 753]. As these results indicated the need for further studies along similar lines, field trials were undertaken in Northern Nigeria with inoculation schedules decided upon by the WHO Expert Committee on Rabies. The trials, 33 in all, extended over a 6-month period in 1957 and were confined to the adult males in 3 villages.

In the inoculation schedules the vaccines used were: HEP freeze-dried Flury vaccine—a 70% suspension of whole chick embryo infected with the high egg passage Flury strain of rabies virus—given, after reconstitution, in 0·2 ml. doses intradermally; duck embryo vaccine—a suspension of embryonic duck tissue infected with fixed rabies virus, inactivated with beta-propiolactone —given, after reconstitution, in 1 ml. doses subcutaneously; and phenolized vaccine—a 4% suspension of sheep brain infected with fixed rabies virus, inactivated with phenol—given in 2·5 ml. doses subcutaneously. The antirabies serum, derived from hyperimmunized horses, was contained in 1,000 unit bottles and ordinarily administered in a dosage of 4,000 units. Serum specimens of the inoculated persons were collected, for later determination of antibody content, before the fresh inoculation and at various periods up to, in some cases, 150 days thereafter. In these determinations the effect of "booster doses", given at various intervals after preparatory inoculations of vaccine, with or without serum, was particularly noted. The results of these serum-virus neutralization tests are reported elsewhere.

The present paper confines itself to an account of the organization of the field trials of the various inoculation schedules detailed in the text. Over 3,000 pre- and post-inoculation samples of blood were collected and prepared for

serum neutralization tests. Such blood samples, collected by venepuncture and placed in numbered test-tubes, were left at the room temperature (90°F.) of the " bush laboratory " for 2 hours and then kept in the refrigerator, before being despatched the following morning, in wool-lined wire baskets, on their 8-hour road journey by kit-car to Yaba, where the sera were separated and stored in a cold room in the laboratory. Finally the sera were sent by air to Paris and from there distributed among 7 different laboratories for serum-neutralization testing. *G. Stuart*

ETCHEBARNE, M., BERNAL, P. G. & LEYTON, G. R. **Purification of Rabies Antibodies in Horse Serum and Diagnostic Importance of the Fluorescent Antibody Technique.** *J. Immunology.* 1960, Jan., v. 84, No. 1, 6–10, 2 figs. [32 refs.]

For the concentration and purification of antirabies hyperimmune serum various procedures, based on fractionation, have been employed. Such fractionation results in recovery from the serum of its gamma globulin fraction, in which the specific neutralizing antibodies are largely localized. In the present paper the authors describe the fractionation of a hyperimmune horse serum by the isoelectric fractional alcohol precipitation method of NICHOL and DEUTSCH (*J. Amer. Chem. Soc.*, 1948, v. 70, 80). They indicate the recovery, at the last stage of fractionation, of the purified antirabies gamma-2 globulin (gamma-2 G); and provide data on the neutralizing activity of that immune fraction and on its use, in combination with fluorescein isocyanate, as a satisfactory conjugate for staining rabies virus antigens in the brains of infected animals.

In the final preparation 10 gm. per litre of serum proved to be the yield of purified gamma-2 G immune fraction, a 54% recovery with respect to the gamma-2 G (19·4 gm.) of the intermediate preparation, crude gamma globulin (Cr-GG). Neutralization tests, carried out with the original hyperimmune serum (in which the antibody content was 2 or 3 times that in the standard serum) and with the gamma-2 G immune fraction isolated, showed the protective titres (50% end points) to correspond to dilutions of 1 in 863 and of 1 in 666, respectively.

Finally, combination of the purified gamma-2 G fraction with the fluorochrome indicated proved to be an eminently suitable conjugate for staining rabies virus antigens. Specific staining was observed in all brain smears from rabid animals, while in those from animals pronounced negative on routine diagnosis there was no staining with the fluorescent antibody technique. One dog, reported as negative by the rapid microscopic examination for Negri bodies, gave a positive result in the specific staining with fluorescent antibody—a positive finding confirmed by rabid symptoms in an inoculated test animal 10 days later. The value of fluorescent antibody staining for the routine diagnosis of rabies, particularly in the case of Negri-negative animals, is emphasized. *G. Stuart*

PLAGUE

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, rodent hosts, transmission, pathology, diagnosis, clinical findings, treatment, control.

MISRA, J., AGARWALA, S. C. & SHRIVASTAVA, D. L. **Studies in the Enzyme Make-Up of *Pasteurella pestis*. Part VII. Deamination of Purine and Pyrimidine Compounds by Virulent and Avirulent Strains.** *Indian J. Med. Res.* 1960, Jan., v. 48, No. 1, 1–7, 2 graphs.

DZHAPARIDZE, M. N. & SIDOROVA, N. K. **The Effects of *Pasteurella pestis* on Some Aspects of the Metabolism of Animals susceptible to Plague. II. Changes in the Citric Acid Content of White Mice during Plague Infection.** *J. Microbiol., Epidemiol. & Immunobiol.* London. 1959, v. 30, No. 2, 113–17. [Translated from Russian.]

White mice, experimentally infected with plague, were found to have a reduced citric acid concentration in their tissues as compared with such estimations in normal control animals: the citric acid content of the liver, lungs and brains of infected mice was approximately half that found in these organs in healthy controls. This decrease indicates a disturbance of the tricarboxylic acid (Krebs) cycle and could well explain the increased survival rate of animals experimentally infected with plague, who receive injections of citric acid.

It was found that the injection of sodium citrate and sodium succinate into mice infected with plague increased their resistance to the plague toxin. This is presumed to be due to the correction of the disturbance of the Krebs cycle. In this English version it appears that the effects of the experimental infection are attributable to the plague toxin; details of the preparation of the plague toxin used in the experiments reported in this paper are not described.

H. J. Bensted

PACKER, L., RUST, J. H., Jr. & AJL, S. J. **Action of Plague Murine Toxin on Mammalian Mitochondrial Respiration.** *J. Bacteriology.* 1959, Nov., v. 78, No. 5, 658–63, 3 figs. [10 refs.]

" Purified plague murine toxin has been found to inhibit the respiration of heart mitochondria obtained from the toxin-sensitive rat and mouse, and not from the toxin-resistant rabbit. Only exogenous respiration is inhibited; endogenous respiration and oxidative phosphorylation are unaffected. This inhibition is specific, *i.e.*, bovine serum albumin, the Vi [coli] and O [typhoid] lipopolysaccharide antigens, for example, were not found to interfere with mitochondrial respiration. A correlation exists between the toxicity of the toxin molecule and its ability to inhibit mitochondrial respiration. Thus, heat-treated toxin is atoxic, and also has lost its ability to inhibit mitochondrial respiration. A hypothesis is presented which, if established, may offer an explanation for the action of plague murine toxin *in vivo*."

PARKER, D. D. & HOWELL, J. F. **Host-Flea Relationships in the Great Salt Lake Desert.** *J. Parasitology*. 1959, Dec., v. 45, No. 6, 597–604. [13 refs.]

In a survey of host-flea relationships in the Great Salt Lake Desert, 10,000 mammals and 1,500 birds were examined comprising 49 mammal species and 247 bird species and subspecies. Not all species carried fleas; only 3 species of birds were found to have fleas and only 25 species of mammal. In all, 45 species of fleas were recorded. The dusting habits of little pocket mice (*Perognathus longimembris*) and kangaroo mice (*Microdipodops megacephalus*) were thought to be a possible cause for the absence of fleas from these species. Lists of hosts and parasites are given. *E. R. Nye*

POKROVSKAIA, M. P., MAKARENKO, I. G., KRASKINA, N. A., BRAUDE, N. I., PRIADKINA, M. D. & GUTOROVA, N. M. **The Significance of Cytochemical Investigations in the Study of Immunological Problems.** *J. Microbiol., Epidemiol. & Immunobiol.* London. 1959, v. 30, No. 1, 4–13, 2 figs. [Translated from Russian.]

A suspension of living avirulent *Pasteurella pestis* was administered to guineapigs by a single combined intradermal-subcutaneous injection followed in some animals by a course of inhalations and nasal instillations of the vaccine. The animals were killed at intervals of 40 minutes to 27 days after vaccination and impression preparations of the injection site and internal organs were made and were examined for intracellular polysaccharides by the method of Shabadash [unknown to the reviewer].

Numerous neutrophil polymorphs aggregated at the injection site and within 3–4 hours started to release fragments of cytoplasm rich in glycogen [this latter phenomenon is termed "klasmatosis"]. The glycogen-rich fragments were taken up by cells of the reticulo-endothelial system which appeared at the site slightly later and subsequently developed into macrophages. Some of the macrophages also exhibited klasmatosis, and this was associated with degenerative nuclear and cytoplasmic changes. Such cells were considered to be incapable of utilizing the phagocytosed glycogen, which remained in large clumps as free lyoglycogen, uncombined with cytoplasmic structures. The lyoglycogen shed by degenerative macrophages was phagocytosed by later generations of macrophages and was broken down into finer uniform granules which resisted hydrolysis by amylase and were regarded as polysaccharide combined with cytoplasmic structures.

Animals receiving vaccine solely by injection have a poor macrophage response in the lungs and develop a poor resistance to pneumonic plague, whereas those vaccinated also by inhalation have a more pronounced pulmonary macrophage reaction, including numerous macrophages rich in fine granules of amylase-resistant polysaccharide, and develop a higher degree of immunity to pneumonic plague. It is concluded that the transfer of glycogen from cell to cell by klasmatosis and phagocytosis, and the utilization of glycogen by macrophages, are of importance in the development of immunity, and that the appearance, at the site of administration of the vaccine, of numerous macrophages containing fine granules of amylase-resistant polysaccharide, is a good indication of the efficacy of vaccination.

[There is no evidence, nor do the authors claim, that demonstration of intracellular polysaccharides provides a better indication of the effectiveness of vaccination than does the occurrence of a pronounced macrophage reaction.]

J. R. Anderson

CHOLERA

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

ABOU-GAREEB, A. H. **Some Epidemiological Observations on Cholera at Calcutta in Connection with Shallow Wells and Water Reservoirs.** *Calcutta Med. J.* 1959, Sept., v. 56, No. 9, 317–24, 5 figs. on 2 pls. & 2 diagrams.

Calcutta is a cholera endemic area where the infection persists throughout the year. The city is provided with a piped supply of purified water, but unlimited supplies of this purified water are not continuously available throughout the city. Because of this, and for other reasons also, much of the water used by those living in the poorer neighbourhoods such as groups of hutments or Bustee areas, as they are called, comes not from freshly collected supplies of purified water but from other sources—raw river water, canal water or directly from shallow wells. Even when water comes from the purified source originally it is used from supplies stored in unsatisfactory containers freely open to every sort of contamination.

The study reported here involved a small number of cases of cholera occurring in patients living in a Bustee area in Calcutta, which there was good reason to suspect were associated with the water supply. The bacteriological and epidemiological investigations provided evidence which connected the disease, in at least one of the patients, with the consumption of water from a shallow well shown to be contaminated with true cholera vibrios. *Vibrio cholerae*, sub-type Ogawa, was isolated from the water 6 days before one of the patients who used this supply developed an acute clinical attack of cholera and from whose faecal excretions the Ogawa sub-type of cholera vibrio was isolated. *H. J. Bensted*

GHOSH, S. N. & MUKERJEE, S. **Studies on the Nature of Ultrasonic Extract of Cholera Vibrio. Part I: Studies on Toxicity and Pathogenicity.** *Ann. Biochem. & Exper. Med.* 1959, July, v. 19, No. 7, 173–80, 1 fig. on pl.

Thick suspensions of cholera vibrios (17×10^{10} vibrios/ml.) were disintegrated by ultrasonic vibrations and the clear soluble extract separated from the cell debris by centrifugation. The deposit was washed and resuspended in saline; it was designated as the insoluble fraction while the clear supernatant was called the soluble fraction.

The extracts were found to be toxic for mice, guineapigs and rabbits, guineapigs being the least susceptible, but the results were not regular. The ligated intestinal-loop test was negative. Skin tests indicated that the skin-reacting factor of the living vibrio was present in the soluble extract; it was

absent in heat killed vibrios. In immunized animals the results of the injection of living vibrios, heat killed vibrios or the soluble extract were similar and they were considered to be allergic in nature. *H. J. Bensted*

JENKIN, C. R. **The Immunological Relationship of a Protein Toxin from *Vibrio cholerae* to its 'O' Somatic Antigen.** *Immunology*. Oxford. 1959, Oct., v. 2, No. 4, 363–7.

This is an extension of the work previously reported by JENKIN and ROWLEY [this *Bulletin*, 1960, v. 57, 123] relating to the isolation of toxic proteins, lethal to mice, which were isolated from *Vibrio cholerae* and water vibrios. The results of this work had suggested that the toxic protein isolated from cholera vibrios (whole organisms) might be the same as the toxic fraction obtained from the Boivin-type antigen.

The present paper brings forward further evidence to support the view that the protein component of the Boivin antigen is, in fact, identical to the toxic protein isolated from the whole organism. It would appear that the protein toxins isolated from various vibrio species have some antigenic relationship but the lipopolysaccharides are type-specific like those from other Gram-negative bacilli. Attention is again drawn to the fact that lipopolysaccharides of cholera vibrios, although non-toxic, resemble those of other Gram-negative bacteria in their biological properties and account for the immunological specificity of the O-antigen complex. *H. J. Bensted*

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

LUPAŞCO, G., SPÎNU, I., SORESCO, Angela, PANAITESCO, D., HACIG, Alice & SOLOMON, Paula. Notes préliminaires sur la présence d'*Entamoeba dysenteriae* en Roumanie. [**Preliminary Researches of *E. histolytica* Infections in Rumania**] *Arch. Roumaines Path. Expér. et Microbiol.* 1959, June, v. 18, No. 2, 215–22, 3 figs. [24 refs.]

The authors have carried out a survey of the incidence of *Entamoeba histolytica* infection among 404 persons resident in an unnamed town of Rumania, comprising 277 children from various institutions and 127 adults, including the personnel of these institutions and workers engaged in food production. Diagnosis was based on examination of stool specimens in direct saline and iodine preparations, as well as after concentration, and by culture. Infection with *E. histolytica* was detected in 19 persons (4·7%).

C. A. Hoare

HILKER, Doris M. & WHITE, A. G. C. **Some Aspects of the Carbohydrate Metabolism of *Entamoeba histolytica*.** *Exper. Parasit.* New York. 1959, Dec., v. 8, No. 6, 539–48, 2 figs. [19 refs.]

BURROWS, R. B. **Morphological Differentiation of *Entamoeba hartmanni* and *E. polecki* from *E. histolytica*.** *Amer. J. Trop. Med. & Hyg.* 1959, Sept., v. 8, No. 5, 583–9, 2 figs. [14 refs.]

The occurrence in man of morphologically similar large and small amoebae belonging to 3 species, *viz. Entamoeba histolytica* with large and dwarf forms, *E. hartmanni* and *E. polecki* [this *Bulletin*, 1954, v. 51, 1250; 1956, v. 53, 755], poses the question of their differential diagnosis. With this end in view, the author has made a careful study of iron-haematoxylin stained specimens of all 4 types, the appearance of which is illustrated in 4 sets of figures, depicting paired forms agreeing in shapes and sizes side by side as follows:— *E. hartmanni*—dwarf *E. histolytica*: (1) trophozoites and (2) cysts; *E. polecki*—large *E. histolytica*: (3) trophozoites and (4) cysts. The differential characters of these forms, which are described in detail, are as follows: (a) *E. hartmanni* is distinguished from dwarf *E. histolytica* by the smaller size of its trophozoites (3–10·5 μ in the first species and from 6·5 μ to size of large forms in the second); by its smaller cysts (3·8–8 μ and upwards of 5·5 μ, respectively); by the smaller ratio of nuclear diameter to cyst diameter; and by diffuse vacuolation of cysts; (b) *E. polecki* is distinguished from large *E. histolytica* by the more variable nuclear structure of trophozoites and cysts; by darker nucleoplasm; by the cysts being typically uninucleate; by the smaller ratio of nuclear diameter to cyst diameter; by the presence of "inclusion masses" in the cytoplasm and by diffuse vacuolation of the cysts; on the other hand, the dimensions of trophozoites and cysts of both these species are alike.

[The name *E. polecki* was given by PROWAZEK (1912) to a mixture of amoebae which—in the absence of a recognizable description—cannot be identified. As it is impossible to determine which of the known porcine or human amoebae had actually been seen by him, the "species" in question cannot be used for any of them and should be rejected as *nomen nudum*. However, if it is confirmed that the amoeba now referred to "*E. polecki*" is indeed a distinct human parasite, it will be necessary to call it by a different name, the choice of which will depend upon whether it is a "good species" or identical with some known one.] *C. A. Hoare*

HOARE, C. A. **Amoebic Infections in Animals.** Reprinted from *Vet. Rev. & Annotations*. 1959, Oct., v. 5, Pt. 2, 91–102, 4 figs. on 4 pls. [47 refs.]

This paper brings together descriptions of the 24 species of amoebae (*Entamoeba, Endolimax* and *Iodamoeba*) which have been reported from animals of economic, public health and laboratory importance, including the human pathogen *Entamoeba histolytica* from macaque monkeys (*Macaca* spp.), dogs, pigs, rats, cattle and cats (natural infections in all except the last-named animal). Of these, dogs and rats may occasionally be the source of human infections, and there is a risk that handlers of macaques (which are widely used in laboratories, large numbers being imported into Europe and America for the production of antipoliomyelitis vaccine) might contract amoebiasis from these monkeys.

Anyone wishing to attempt to diagnose *E. histolytica* infections in domestic or laboratory animals will find this paper very helpful: it also draws attention

to the incompleteness of present knowledge of the relationships between some of the morphologically identical amoebae which parasitize man and other mammals. *J. R. Baker*

Sosa Camacho, B. & Beirana, L. Amibiasis cutánea genital. Communicación de un caso. [**A Case of Genital Cutaneous Amoebiasis**] *Dermatologia.* Mexico. 1959, June, v. 3, No. 2, 127–33, 7 figs.

The English summary appended to the paper is as follows:—

"A case of a dermatosis is studied in which an ulcerated lesion of the penis with abundant secretion is found in a young male who practices active pederasty.

"The lesion has been diagnosed clinically as a carcinoma. The pathological report and the clinical aspect did not correspond to carcinoma so a culture of the secretion was performed with a report of numerous histolytic ameba.

"A successful result followed the use of emetine and oxiquinoleine."

Wilmot, A. J., Powell, S. J. & Adams, E. B. **Chloroquine compared with Chloroquine and Emetine combined in Amebic Liver Abscess.** *Amer. J. Trop. Med. & Hyg.* 1959, Nov., v. 8, No. 6, 623–4.

It has already been shown that in amoebic liver abscess there is a higher relapse rate in patients treated with chloroquine alone than in those treated with two courses of emetine [this *Bulletin*, 1958, v. 55, 893]. The present paper represents a further trial to find out whether the relapse rate might be reduced by increasing the dose of chloroquine, or combining it with a single course of emetine.

48 African male patients with amoebic liver abscess selected at random were given one or the other course of treatment. In all patients the diagnosis was established by aspiration of pus in which *Entamoeba histolytica* was identified in 40 (83%). The treatment schedules were:—

Group A: emetine intramuscularly, 1 grain for 10 days; chloroquine sulphate, or diphosphate (dose is expressed as mgm. of the base), 600 mgm. immediately, followed by 300 mgm. 6 hours later and subsequently 150 mgm. twice daily for 29 days; di-iodohydroxyquinoline 600 mgm. 3 times daily for 20 days.

Group B: chloroquine (sulphate or diphosphate) as above (except that the 150 mgm. dose was given 3 times daily) and in same dosage, followed by the same course of di-iodohydroxyquinoline. Tetracycline, 1 gm. daily for 10 days, was given to patients with active amoebic dysentery.

The two last-named drugs are not considered effective in liver abscess, but are used to control the intestinal infection.

22 patients were allotted to group A and 23 to group B. All were retained in hospital for 30 days and were subsequently re-examined at intervals of 1, 3 and 6 months.

3 patients died; 2 belonged to group A and 1 to group B. In 2 death was due to rupture into the peritoneum and in 1 to multiple abscesses.

The initial response of all patients was similar and satisfactory, but there were no relapses in group A, compared with 5 (21%) in group B. In 3 of

these pus was again aspirated from the liver. Toxic effects were noted only in group B.

The significant relapse rate, when chloroquine is given by itself, even in high dosages, indicates that it is an inadequate therapy for liver abscess. It is realized that a single 10-day course of emetine is inadequate. A double course greatly reduces the relapse rate. The results of this enquiry clearly indicate that a single course of emetine combined with a standard dose of chloroquine provides a satisfactory cure with little tendency to relapse. Chloroquine alone remains the drug of choice in patients in whom cardiovascular disease contra-indicates the use of emetine. *Philip Manson-Bahr*

MANDOUL, R., DARGELOS, R. & BOUR, Y. *Chilomastix* et Trichomycine *in vitro*. [**Effect of Trichomycin on** *Chilomastix mesnili in vitro*] *Bull. Soc. Path. Exot.* 1959, Sept.–Oct., v. 52, No. 5, 607–13. [16 refs.]

Trichomycin [*Bull. Hyg.*, 1954, v. 29, 1094] was obtained from a *Streptomyces* in the soil in 1952, but has not been chemically defined. It is effective against some moulds and also against *Trichomonas*, and may be used locally or by mouth. The authors have now compared the action of trichomycin, chlortetracycline and oxytetracycline against *Chilomastix mesnili* grown *in vitro* in presence of intestinal bacteria. The test lasted over a period of 6 hours at 37°C. After the parasites present were counted the effect of the drug on motility and numbers was determined, and the parasites recovered by centrifugation were then resuspended in fresh medium after washing and similar observations were made. The effect exerted by the 3 drugs at different concentrations is shown in tables. Trichomycin was very much superior in activity to the others, being lethal in a concentration of 2·5 μgm. per 5 ml., and *Chilomastix mesnili* appeared to be as sensitive as *T. vaginalis* to its action, which was rapid. *J. D. Fulton*

MANDOUL, R., DARGELOS, R. & BOUR, Y. Étude du mode d'action de la Trichomycine sur *Chilomastix in vitro*. [**Mode of Action of Trichomycin on** *Chilomastix in vitro*] *Bull. Soc. Path. Exot.* 1959, Sept.–Oct., v. 52, No. 5, 613–18.

The authors were struck by the rapidity of action of trichomycin against *Chilomastix mesnili* compared with that of chlortetracycline and oxytetracycline, so they investigated its mode of action. The effect of trichomycin on the parasite at very low concentrations was studied under the microscope. First there was lowered motility, then a swelling of the organism followed by explosive break up. Haemolytic properties of this substance have been noted by Japanese workers and have now been confirmed and compared with similar properties of a cationic quaternary ammonium salt (Desogene—a Geigy product). The effect of these two substances on *Chilomastix* was also noted. Both as haemolytic agent and in its behaviour against *Chilomastix*, trichomycin was much more active weight for weight. The surface tension of the 2 solutions was also determined and found to be comparable. The activity of trichomycin thus appears to depend on its qualities as a surface-active agent rather than on its character of antibiotic. *J. D. Fulton*

RELAPSING FEVER AND OTHER SPIROCHAETOSES

FEN, Chun-Tzi. **[The Study of the Vectors of Tick-Borne Relapsing Fever in China]** *Dokl. Akad. Nauk SSSR.* Moscow. 1958, v. 121, No. 4, 766–8. [In Russian.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1960, Feb., v. 48, Pt. 2, 48.]

Foci of tick-borne relapsing fever, transmitted by *Ornithodoros tholozani* (Lab. & Mégn.) (*papillipes* (Bir.)), were found in Kashgar, in the Sinkiang-Uighur region of western China, in the summer of 1956, and a survey was therefore made for ticks of this genus round Urumchi, the capital of the region, in September 1957. Numerous examples of *Argas persicus* (Oken) were found in fowl houses, but none of *Ornithodoros*. Investigations in an outlying district showed that *O. tartakovskyi* Olen. was present in burrows near ruins in the semi-desert, 94 larvae, 892 nymphs, 134 adult males and 106 females being taken in three out of about 20 of these. This species was until recently known only from the Soviet Union and has not previously been recorded in China. Batches of 30–40 examples were fed on 24 white mice, and 17 of the latter showed symptoms in 4–8 days. The disease lasted 8–14 days in the mice. Spirochaetes of relapsing fever were found in their blood, though they were not numerous, and three batches of the same ticks infected white mice by bite three months later. The strain of spirochaetes obtained was also infective for rabbits and hamsters (*Cricetus* (*Mesocricetus*) *auratus*), but not for guineapigs. In similar tests with 35 examples of *O. tholozani* collected from the nests of mice in houses in Kashgar, spirochaetes were observed for 19–21 days in the blood of guineapigs on which they fed, beginning on the sixth day.

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

WORLD HEALTH ORGANIZATION. TECHNICAL REPORT SER. No. 189. **Expert Committee on Leprosy. Second Report, Geneva, 3–8 August 1959.** 27 pp. 1960. Geneva: Palais des Nations. [Sales agent for U.K., H.M. Stationery Office.] [1s. 9d.; $0.30; Sw.fr. 1.–.]

The Expert Committee met in Geneva from 3 to 8 August 1959. It consisted of 5 international members who were leprosy experts, and 4 representatives of the Secretariat of WHO. This is the second report of a WHO Expert Committee on leprosy [the first was published in 1953, see this *Bulletin*, 1954, v. 51, 270].

The report is divided into 10 sections.

(1) The infectivity and mode of spread are discussed. These depend on the infectiousness of the patient, the susceptibility of the exposed person, and the type of contact. It is suggested that high susceptibility may be combined with a high degree of resistance, and that this "may explain the pattern of leprosy in Africa and other countries, in which can be observed high prevalence with low lepromatous rates".

(2) The lepromin reaction is next dealt with. It is important that in preparing the antigen the bacillary elements of lepromas be utilized as much as possible, that preparation should be simple, and that the antigen be standardized, and prepared from "pooled" lepromas. Methods of purification, dilution and standardization are described. The minimal diameter of the late reading to be counted as positive was left open "pending further histological studies of the reaction lesions".

(3) The Committee next considers BCG and chemotherapy in leprosy prevention. Regarding the efficacy of BCG it was considered that most trials so far have been on too small a scale, have not had proper statistical planning, or have been done too recently to assess results. If BCG confers any material protection against leprosy then it is to be expected that the mass antituberculosis campaigns now under way in countries where leprosy is endemic will reduce the incidence of leprosy in them. Details are given of a possible plan for testing the preventive properties of BCG and sulphone in one large experiment.

(4) Leprosy Control occupies the longest section of the report. After a preliminary investigation to size up the problem in its extent and distribution, a pilot project is defined as having the object of training personnel, and "to adapt medical, administrative, and field techniques to local conditions". Later a case-finding mass campaign is pursued on a large scale. The methods of choosing areas for projects, choosing and training staff, and assessing results are given in detail.

(5) Under Therapy DDS is chosen because of its effectiveness, simplicity and low cost, being particularly appropriate for mass treatment campaigns. Six criteria, with a possible seventh, are given for assessment of progress under treatment. It is recommended that WHO should assist in controlled chemotherapeutic investigations.

(6) The question of rehabilitation of disabled patients is next discussed. It is estimated that some 25% of all patients have some physical disability. A classification of these deformities is given and the methods of prevention and restoration are described.

(7) The importance of teaching and training in leprosy is stressed. Doctors, medical undergraduates, paramedical personnel, and social workers have to be trained, while patients and society at large must be taught the true nature of leprosy and how it may be prevented and treated.

(8) Under Classification there is agreement "that in classification priority should be given, as in the past, to the clinical criteria (including the bacteriological findings when that examination can be made)". A note was made of the recommendation of the Tokyo Classification Committee that an appeal be made to WHO to take steps to contribute to the solution of existing problems of classification before the next international congress.

(9) Under Research, the need for further efforts to culture the bacillus and transmit the disease is stressed. "If either of these objects can be achieved, there will be a new approach to many problems".

(10) The last matter dealt with is legislation. The Committee strongly endorses the opinions of recent conferences that leprosy should be placed in the same category as communicable diseases and dealt with as such by the public health authorities. *Ernest Muir*

MERLE, F. De la contagion de la lèpre en milieu familial. **[Leprosy Contagion within the Family]** *Méd. Trop.* Marseilles. 1960, Jan.–Feb., v. 20, No. 1, 76–80, 1 map.

An enquiry was made in the French Cameroons among 13,104 leprosy patients as to the source of infection. All the doctors taking part in the enquiry gave approximately the same results averaging 45·21% of familial infection. But if all the other relations besides parents who live almost next door were included, the number would be considerably more. The mobile dispensary under these circumstances cannot entirely take the place of the leprosarium.

The author is altogether opposed to the old form of compulsory leprosarium. He is in favour of leprosy villages where patients can be brought voluntarily under a certain amount of control as regards treatment and the prevention of contagion. [It would mean grouping some 40,000 patients in 200 villages, which seems a somewhat Utopian idea.] *Ernest Muir*

PENNEC, J. & SAUTET, J. Remarques médico-sociales et épidémiologiques résultant de l'étude de dix ans d'hospitalisation de lépreux en léproserie de ségrégation insulaire et en hôpital libre. **[Medico-Social and Epidemiological Observations Resulting from a Study of Ten Years of Hospitalization of Leprosy Patients in a Segregation Island and in a Free Hospital]** *Méd. Trop.* Marseilles. 1960, Jan.–Feb., v. 20, No. 1, 56–65.

The authors, after making a study of the records of the leprosy patients in the segregation island of Désirade, and in the free hospital at Pointe-Noire on the island of Guadeloupe itself, have recorded their findings in 7 tables. These record the movements of the patients, and the numbers according to age and sex, for the years 1950 to 1959; the regions from which they came and their occupations; the clinical forms of the disease; the causes of death; those passing out of the hospitals and their clinical types; the periods in the hospitals according to the type of disease.

One of the most surprising findings is that of the 17 deaths over the period 7 were caused by cancer: 3 of the breast, 1 of the uterus, 3 of the digestive tract. Of the total patients over the period 119 were lepromatous and 79 non-lepromatous. *Ernest Muir*

JARDIN, C. & BEYTOUT, D. Étude des protéines sériques du Soudanais hansénien par micro-électrophorèse. Essai d'interprétation des résultats. **[A Study of the Serum Protein of Sudanese Leprosy Patients by means of Micro-electrophoresis]** *Méd. Trop.* Marseilles. 1960, Jan.–Feb., v. 20, No. 1, 81–101, 2 graphs. [108 refs.]

After referring to the results of other workers, the authors give the results of testing the serum protein of 24 lepromatous and 44 tuberculoid patients compared with that of 33 apparently healthy subjects from Sudan, French West Africa. While in the tuberculoid cases the total protein was not increased relative to the controls, in the lepromatous type it was increased.

In lepromatous leprosy, contrary to the findings of other workers, gamma globulin, though increased relative to total protein, was not increased in proportion to the other globulins. The authors consider that alterations in the different fractions may be due not to lepromatous leprosy but to complicating conditions such as amyloidosis, nephrosis, tuberculosis. The differing results may also be caused by the fact that the Sudanese subjects used as apparently healthy controls were actually infected with parasites (particularly *Schistosoma*), and also had various infections and malnutrition which tend to increase the gamma globulin fraction.

Details are given of the electrophoretic methods used. *Ernest Muir*

ZAMUDIO, L. Contribución al estudio de los trastornos óseos y articulares de los pies en los enfermos hansenianos. [**Study of Bone and Joint Lesions of the Feet in Leprosy Patients**] *Dermatología*. Mexico. 1959, Sept., v. 3, No. 3, 210–23, 7 figs. [17 refs.] English summary (4 lines).

FRENKEN, J. H. Síndrome de Gougerot-Sjögren y Lepra. Estudio de un caso ambos padecimientos. [**Gougerot-Sjögren's Syndrome and Leprosy. Report of a Case**] *Dermatología*. Mexico. 1959, June, v. 3, No. 2, 134–58, 7 figs. [40 refs.]

The English summary appended to the paper is as follows:—

"Gougerot-Sjögren's Syndrome is reviewed. The author presents a young female with leprosy and a dry kerato-conjunctivitis. An explanation is given as to why the author suggests that in this young female, with no ovarian pathology or arthritis, the syndrome can be associated with Hansen's disease."

MICHEL, G. Étude des lipides de *Mycobacterium marianum*. [**Study of the Lipids of** *Mycobacterium marianum*] *Bull. Soc. Chimie Biol.* 1959, v. 41, No. 12, 1649–69, 2 figs. [33 refs.]

HART, P. D'A. & VALENTINE, R. C. **Elongation of a Leprosy Bacillus** (*Mycobacterium lepraemurium*) **in a Cell-Free Medium.** [Correspondence.] *Nature*. 1960, Jan. 2, v. 185, 58–60.

The medium in which this elongation occurred consisted of a basal medium containing Difco Casamino acids 2·5 gm., asparagine 0·3 gm., anhydrous disodium hydrogen phosphate 2·5 gm., potassium dihydrogen phosphate 1·0 gm., sodium citrate 1·5 gm., crystalline magnesium sulphate 0·6 gm., glycerol 25 ml., distilled water to 1000 ml., and bovine plasma albumin (fraction V) to make 0·25%, and to this various concentrations of glucose or sucrose were added. The bacilli were from the homogenized livers of mice which had been infected intravenously, and the size of the bacilli was measured on the fluorescent screen of an electron microscope, the measurements being made after 7, 14, 28 and 63 days' incubation at 37°C.

In the basal medium, without the carbohydrates, the average length of the bacilli increased from 1·64 μ to 2·14 μ after 28 days' incubation, by which time 80% of the bacilli were degenerate, but when glucose or sucrose was added the length of the bacilli increased to 3·12 μ and 2·42 μ in the presence of 10% and 20% sucrose, respectively, with only 20% and 30% of degenerate forms being present, and to 2·7 μ with only 10% of degenerate forms in the presence of 8% glucose. After 63 days' incubation the mean length in the presence of 10% sucrose was 3·44 μ but 95% of the bacilli were degenerate. No elongation occurred in water, in a phosphate buffer, with or without 20% sucrose, or in the basal medium + 10% sucrose when 5 μgm. isoniazid per ml. was added.

The authors consider that this elongation represents a real increase in bacterial protoplasm and therefore the failure of the bacilli to multiply in this medium is due to their inability to divide. [These high concentrations of carbohydrates were added in an attempt to prevent the degeneration of the bacilli.] *S. R. M. Bushby*

Sushida, K. & Hirano, N. **Paper Electrophoresis of Sera of Leprous Mice.** *Yokohama Med. Bull.* 1959, Oct., v. 10, No. 5, 257–64, 4 figs. [26 refs.]

" Paper electrophoresis on the serum protein of the leprous mice was made at different intervals for 12½ months after infection. Observations also were made on cases of both the leproma and leproma-ulcer groups, which were separated into these two groups according to the involvement at the site of inoculation.

" 1. The serum protein of leprous mice showed a decrease of albumin fraction and an increase of β-globulin fraction at about the 16th week after the inoculation, and then an increase of the α-globulin at about the 10th month. These alterations were each time more marked in the leproma-ulcer group than in the leproma group. The alteration of the γ-globulin was not observed in any case.

" 2. The increases of α-lipoprotein were shown markedly in both the leproma and leproma-ulcer group. The changes appeared only 10 months after infection.

" 3. The increase of the α-polysaccharide was marked in the leproma-ulcer group about 7 months after infection, but not in the leproma group.

" 4. The alteration of all serum fractions of the ' spontaneous cure? ' group, in which leproma was hardly papable, was almost normal."

[See this *Bulletin*, 1959, v. 56, 845.]

Tanimura, T., Nishimura, S. & Iwasa, K. **The Screening Test for Chemotherapeutic Agents for Leprosy.** *Internat. J. Leprosy.* Wash. 1959, July–Sept., v. 27, No. 3, 236–49.

Many attempts have been made to use murine leprosy for forecasting the value of chemotherapeutic drugs for the treatment of human leprosy, but as the results have varied greatly the authors have endeavoured to standardize a method which could be generally adopted.

They first compared the virulence of the Japanese strains of *Mycobacterium lepraemurium* with the Hawaiian strain. The bacilli were obtained from lepromas, and 0·2 ml. of suspensions containing approximately 5×10^7 organisms/ml. were inoculated subcutaneously into mice. Judged by the size of the leproma and the spread of the bacilli to the viscera, the Hawaiian strain was considered to be of equal virulence with 2 of the other strains, and the 4th strain to be less virulent; the authors therefore recommend that the Hawaiian strain be adopted for general use. But they then compared the results of injecting it by the subcutaneous, intraperitoneal and intravenous routes. The subcutaneous route was considered to have the advantages of ease of injection, of requiring only a relatively small inoculum (10^3–10^5 organisms), that effects of chemotherapy could be most easily assessed, and it had the relatively short experimental period of 3–5 months; it was therefore recommended as the preferable route.

The authors then gave considerations to alternative methods of assessing the efficacy of the drugs and to the strain of mice that could be recommended. They concluded that simple measurement of the size of the local leproma, measured every 15th day of an experimental period of 3 months, was preferable to the weighing of the lepromas or of the spleens, or to the counting of the number of bacilli present in the lesions. They also concluded that none of the 8 strains of mice available to them was especially susceptible to the infection, and so they recommended that the readily available strain, NA_1, be adopted as the standard strain. Their final recommendation was that the test drugs be given 6 times a week, starting from the day after infection, and that the dose be 1/30th to 1/100th of the LD50 dose.

[The adoption of this recommendation might enable more consistent results to be obtained, but in view of some of the diametrically opposed activities, reported by different authors using different methods with the same drug, there is no reason for expecting the general use of this particular method to answer the question of the value of screening potential antileprotic drugs against murine leprosy.] *S. R. M. Bushby*

MUROHASHI, T. **Application of Malachitegreen-Fuchsin Staining to the Evaluation of the Therapeutic Effect of Kanamycin Administration on the Rats with Murine Leprosy.** *Acta Tuberculosea Scandinavica.* 1960, v. 38, No. 1, 18–23.

By grinding and digesting a small portion of the lepromas from rats, injected subcutaneously with *Mycobacterium lepraemurium* derived from the leproma of another infected rat, and by making a standard size smear with a loop that delivered 0·005 ml., the author claims that the total number of bacilli in the leproma and the proportion of viable to dead bacilli can be determined by staining with the malachite green-fuchsin method [MUROHASHI and YOSHIDA, *Bull. Hyg.*, 1959, v. 34, 486]. [With this stain tubercle bacilli stain green and dead ones pink.]

A quantitative and qualitative comparison of the bacilli in homogenates of the lepromas of 5 rats, treated with 5 mgm. of kanamycin subcutaneously daily for 3 months from the 3rd month after infection, with those of 5 untreated rats showed that the total number of bacilli per mgm. of leproma in the treated group was 1/10th to 1/100th of that of the control group, and the

proportion of green, *i.e.* living bacilli, ranged from 6 to 60% in the treated group and from 88 to 96% in the control group. The weights of the lepromas of the untreated rats ranged from 400 to 730 mgm., average 574 mgm., and of the treated rats from 10 to 630 mgm., average 206 mgm.

This method of staining is therefore considered to be of value for comparing the therapeutic value of drugs or vaccines in this infection.

[Details of the staining method and the calculation for estimating the number of bacilli present in the homogenates, from the number of bacilli per microscope field, are given.] *S. R. M. Bushby*

HELMINTHIASIS

In this section abstracts are arranged as far as possible in the following order:—TREMATODES (*schistosomes, other flukes*); CESTODES (*Diphyllobothrium, Taenia, Echinococcus, other cestodes*); NEMATODES (*hookworms, Ascaris, filarial worms, Dracunculus, etc., Trichuris, Enterobius, Trichinella, etc.*).

WATSON, J. M. **Medical Helminthology.**

This book was reviewed on p. 431.

EAST AFRICAN MED. J. 1958, Aug., v. 35, No. 8, 389–510, illustrated. [Numerous refs.] **The Conference on the Helminthic Diseases and their Effects on Man and Animals held at Nairobi in January, 1958 and organized by the East African Council for Medical Research.**

His Excellency the Acting Governor of Kenya, Sir Richard TURNBULL, welcomed the visitors to the Scientific Conference.

Helminthiasis had been chosen for discussion because of its interest to a large range of scientists; though the medical profession was primarily concerned, it was almost equally important to the veterinary and agricultural workers and to all employers of labour; knowledge was essential to the administrator and to the welfare worker. It affected the happiness and well-being of hundreds of thousands of ordinary men and women and their children.

Professor R. M. GORDON in his Presidential Address recalled his experience in the Sir Alfred Jones Laboratory at Freetown, where each problem had to be tackled as it arose. To succeed, one must work hand in hand with men of other sciences than one's own, and it was essential to make personal contacts with those from other areas who were concerned with similar problems.

Professor R. M. GORDON (*The Reaction to Arthropod Bites and its relation to Arthropod-Borne Infections, with special reference to Filariasis*, pp. 393–400) described the uncomplicated offensive or defensive stings of bees and wasps as being similar to venom being injected through a hypodermic needle.

The parasitic type of bite, in which blood meals were taken and parasites might be transmitted, was complicated by sensitization of the host to the vector and to the parasite, and this might influence the chance of transmission. The inoculation of rickettsiae in the louse faeces was dependent upon the sensitivity of the host to the vector producing scratching, and the transmission

of louse-borne relapsing fever depended upon the crushing of the louse. *Trypanosoma cruzi* was similarly only rubbed into the wound or conjunctiva after rubbing was induced by sensitization to the bite of the vector.

The successful implantation of *Loa loa* might be inhibited by previous sensitization to the parasite.

Each cyclically transmitted parasite, protozoon and helminth, infecting the vertebrate host finds itself in an environment influenced by the manner of feeding of the vector.

P. E. C. Manson-Bahr (*The Clinical Features, Diagnosis, and Host Parasite Relationship of Schistosomiasis in East Africa,* pp. 401–411) discussed the symptoms and signs of *Schistosoma mansoni* and *haematobium* in East Africa, and the methods of diagnosis, and suggested as a measurement of schistosomiasis in a territory:—

(1) the extent of the infection measured by the percentage of egg passers in a population,

(2) the immunity of the population based on the percentage of egg passers in the different age-groups and a measurement of the spleen rate in the younger groups allowing for the influence of malaria,

(3) the intensity of the infection as measured by a clinical study.

Three types of endemicity might be found:—

Hyperendemic: Extent of infection 100%. Immunity of the people high, but overcome by superinfection in youth. Found in Egypt and the Nile Delta.

Endemic: Extent of infection less than 100%. Immunity of the people high but not overcome by superinfection. Found in Rhodesia and in parts of East Africa.

Epidemic: Extent of infection variable. Immunity of the people nil. Found in immigrant Europeans and Asians in East Africa.

Stuart H. Wydell (*Some Abdominal Complications of S. mansoni as seen on Ukerewe Island*, pp. 413–426) said that most of those infected with *S. mansoni* in Mwanza were only identified because of the finding of ova in routine examination of the stools. Among them rarely occurred a granuloma on the ante-mesenteric surface of the small intestine sometimes causing obstruction. The tumours contained the eggs of *S. mansoni* and in most cases treatment with tartar emetic intravenously gave good results and surgical removal was unnecessary.

C. Teesdale and G. S. Nelson (*Recent Work on Schistosomes and Snails in Kenya,* pp. 427–438) described preliminary observations on the snail hosts of the infection and the schistosome species in naturally infected snails in various parts of Kenya. The intermediate host of *S. mansoni* in Central and Western Kenya was *Biomphalaria pfeifferi nairobiensis. B.p. rupellii* was suspect in nature and had been infected in the laboratory. *S. haematobium* had been found to infect *Bulinus* (*Physopsis*) *africanus ovoideus* in the same area but on the coast, where the "*nasutus-africanus*" complex had been found infected, there was still some uncertainty.

Hamsters were excellent hosts of *S. haematobium, S. mansoni* and *S. bovis*. (Most of the *S. haematobium* were probably *S. capense* and the *S. bovis* were probably *S. leiperi*.)

O. D. Standen in discussion stated that he had found that hamsters only produced male infections with *S. haematobium*.

O. D. STANDEN (*An Experimental Approach to the Chemotherapy of Helminthiases*, pp. 439–445) pointed out the great need for an effective anthelmintic suitable for mass or individual treatment in man and for the farmer in the routine treatment of his stock. In the search for new drugs, experimental chemotherapy and fundamental research were complementary. In an empirical approach, large numbers of unrelated substances were tested in the hope that one or more would show sufficient activity to constitute a chemical lead; then in a selective approach, this lead would be exploited by chemical modification. Examples were given in the treatment of schistosomiasis and the threadworms and roundworms.

He believed that the enlightened view of the complementary nature of experimental chemotherapy and fundamental research was not as widely accepted as it should be, and as a result, fundamental research in experimental helminthology was largely denied the advantages of the financial support necessary for large-scale chemotherapeutic investigation.

J. P. DE MELLO (*Ascariasis in General Practice*, pp. 447–456) described the clinical manifestations of infection with *Ascaris* and in reviewing the methods of treatment available concluded that piperazine preparations were effective, safe, and easy to administer to a large community.

Dr. H. M. WOODMAN (*Filariasis with special reference to Loa loa and Onchocerca volvulus*, pp. 457–466) described the differences in loiasis in West Africa and Central Africa including the Sudan. Though the loiasis area in the Sudan was nearly all savannah forest and not rain forest, the incidence of infection with *Loa loa* was high—as high as in the British Cameroons; *Chrysops silacea* rarely occurred, *C. distinctipennis* and *C. longicornis* were usually found. The development of *L. loa* in *C. distinctipennis* was often arrested and took twice or 3 times as long as that in *C. silacea*. Few Europeans in the Sudan who had contracted loiasis had ever seen *Chrysops* and diurnal periodicity of the microfilariae in the blood of man in the Sudan was by no means constant. Alternative vectors should therefore be sought.

He reviewed the known incidence of onchocerciasis in Africa and its economic significance, and discussed methods of control.

P. JORDAN (*An Attempt to eradicate Bancroftian Filariasis on Ukara Island*, pp. 467–474) believed that in parts of Tanganyika 4% or 5% of adults were afflicted with elephantiasis, and hydroceles and hernias, which were the most frequent causes of operation at the Government Hospital at Dar-es-Salaam, might be related to filariasis.

On Ukara Island on Lake Victoria, a pilot scheme had been started in the control of filariasis by treating everyone in 3 areas with Banocide [diethylcarbamazine] monthly or on alternate months. 2 other areas on the island were used as controls, and at the end of a year blood was taken from those initially positive; there was a 90% reduction in the microfilariae most marked in those who originally had had low numbers of microfilariae in the blood.

The pilot scheme was to be followed up for 2 years. No entomological studies had been possible during the pilot experiment.

G. R. BARNLEY and M. A. PRENTICE, discussed *Simulium neavei in Uganda* (pp. 475–485). In certain heavily forested areas onchocerciasis was transmitted by races of *S. neavei* whose development was associated with the crab, *Potomon granviki* (possibly the closely related *P.* (*Rotundopotomonautes*) *beradi beradi*) in the small steams flowing in the densest shade of permanent

rain forest. The larvicidal control of *S. neavei* in these circumstances would be exceedingly difficult physically.

In Kenya, as had been shown by McMahon, *S. neavei* was associated only with *P. niloticus*, living in the more open stretches of large and comparatively fast flowing rivers.

G. J. Grounds (*The Treatment of Onchocerciasis with Suramin (Antrypol) after Vector Eradication*, pp. 487–492) described the treatment of 102 persons infected with onchocerciasis in an area of Southern Nyanza where *Simulium neavei* had been eradicated. 6 gm. of Antrypol given in weekly intravenous doses of 1 gm. were required to clear the skin of microfilariae in 6 months. After half the course, itching stopped, and in some cases the clinical condition of the eyes and skin improved and nodules disappeared. Toxic manifestations included pain, severe itching, and mild exfoliative dermatitis, but no deaths occurred. These cases were to be reviewed a year later.

Professor J. J. C. Buckley (*Occult Filarial Infections of Animal Origin as a Cause of Tropical Pulmonary Eosinophilia*, pp. 493–500) reviewed the literature concerning the association of filarial infections and tropical pulmonary eosinophilia. He drew attention to the work of Danaraj *et al.* [this *Bulletin*, 1957, v. 54, 1341, 1342] which placed on a very sound basis the possibility that filarial infections probably of animal origin were concerned in the aetiology of the disease. He described two experiments in which some of the symptoms and signs of the syndrome were produced in a volunteer inoculated with the infective larvae of two different species of filaria from naturally infected animals. The curative effect of Banocide and the changes in the titre obtained in the filarial complement-fixation tests corresponded with the results observed by Danaraj.

E. G. Holmes (*Some Considerations of the Effects of Helminthic Parasites on Man*, 501–507) in considering the effects on man of helminth parasites pointed out that the survival of the parasite was best ensured by its living peaceably in the host's body to produce eggs which left it in circumstances most favourable to their development. This stabilization might break down to cause disability, and it was not clear whether or not this stabilization was suboptimal from the point of view of the host. Both infection with hookworms and its involvement with nutrition, and the possibilities of nutrition affecting immunity, were related to host-parasite balance.

Professor R. M. Gordon (pp. 509–510) summarized the Conference. There was general agreement that the successful treatment and control of helminth infections in man and beast were dependent on a proper knowledge of the vertebrate host, but it also required an equal or sometimes greater knowledge of the parasite, and if an intermediate molluscan or arthropod host was involved, a knowledge of the life cycle and habits of the vector.

W. E. Kershaw

Nogueira, D. M. & Perez, M. D. Atividade vitaminica B_{12} em parasitas intestinais. [**Vitamin B_{12} Activity of Intestinal Parasites**] *Rev. Inst. Med. Trop. São Paulo.* 1959, Nov.–Dec., v. 1, No. 4, 276–8. [16 refs.]

The English summary appended to the paper is as follows:—

"We found vitamin B_{12} activity in several intestinal parasites, the larger amount (153 to 6,900 mγ/g) being found in *Ancylostoma caninum*, *Ascaridia*

galli, *Strongylus vulgaris*, *Toxocara canis* and *Trichuris vulpis*; and the lower amounts (0·35 to 13 mγ/g) in *Dipylidium caninum* and *Taenia saginata*."

SAIF, M. **The Haemoglobin Level in Parasitic Disease.** *J. Egyptian Med. Ass.* 1959, v. 42, No. 10, 578–82.

"1. The haemoglobin percentage was estimated for each of 4214 individuals of whom 972 were negative for parasites and the rest were suffering from various parasitic infestations. The results were statistically analysed and tabulated for comparison.

"2. The results were also compared with those obtained by Salah [this *Bulletin*, 1936, v. 33, 148] on a similar series of 547 individuals.

"3. All parasitic infestations were found to have a statistically significant effect on the haemoglobin level, especially ancylostoma and intestinal bilharziasis."

[See *ibid.*, 1960, v. 57, 495.]

NELSON, G. S. *Schistosoma mansoni* **Infection in the West Nile District of Uganda. V. Host-Parasite Relationships.** *East African Med. J.* 1959, Jan., v. 36, No. 1, 29–35. [56 refs.]

In the West Nile district of Uganda at least 100,000 people out of a total population of 340,000 are infected with *Schistosoma mansoni*. The infection is of highest incidence in children aged 5–15 years, and though the parasite causes anaemia and splenomegaly in children, most adults show no objective signs of infection.

The mildness of schistosomiasis in the adult African has been ascribed to increased exposure of children and diminished exposure of adults (but this does not seem to be true for the indigenous rural African), and to a hypothetical resistance to infection dependent only upon age *per se*, comparable to infections with other parasites in animals.

Acquired immunity to human schistosomes has been shown experimentally to develop in monkeys, but is unlikely to be the only explanation for the comparative mildness of *S. mansoni* infections in the West Nile districts of Uganda. Human schistosomes probably existed in Central Africa before they invaded Egypt, and it is possible that a racial tolerance in Uganda due to a genetically determined lowered susceptibility to infection and a natural resistance may both contribute. In addition, since there are distinct intra-specific strains of human schistosomes, the apparent mildness of infection may be associated with the lowered pathogenicity of a particular strain of parasite.

Indiscriminate treatment in the absence of a proper understanding of the effects of immunity and of the pathogenicity of the infection may be dangerous, and a detailed clinico-pathological assessment of the importance of schistosome infections in the community in East Africa is urgently required.

[For previous parts, see this *Bulletin*, 1959, v. 56, 317, 318.]

W. E. Kershaw

HABIB, Y. A. & HABIB, S. A. **Serum Sodium and Potassium Concentrations in Bilharziasis.** *J. Egyptian Med. Ass.* 1959, v. 42, No. 10, 567–73, 1 fig. [22 refs.]

The authors, from Cairo University, estimated the concentration of sodium and potassium in the serum of 85 male patients with schistosomiasis, by means of flame photometry.

40 patients had *Schistosoma haematobium* infection and 45 had *S. mansoni*. All those with *S. mansoni* infection had hepatosplenomegaly and 33 of these had ascites as well. The results are shown in a figure and a table. The findings for both sodium and potassium in patients with *S. haematobium* and in those with *S. mansoni* uncomplicated by ascites were within the normal range; serum potassium levels were also normal in the 33 patients with hepatosplenomegaly complicated by ascites, but in these cases the sodium concentration in the serum was statistically lower than normal ($p = < 0{\cdot}001$). The factors concerned in the development of ascites are discussed and it is concluded that the low serum sodium values found in cases of schistosomal hepatic fibrosis with ascites are not due to the *S. mansoni* infection as such, but to the advanced complicating hepatic fibrosis which leads to ascites.

H. J. O'D. Burke-Gaffney

BARBOSA, F. S. & BARBOSA, I. **Observations on the Ability of the Snail *Australorbis nigricans* to Survive out of Water in the Laboratory.** *J. Parasitology*. 1959, Dec., v. 45, No. 6, 627–30, 1 fig.

Observations on two strains of the snail *Australorbis nigricans* (intermediate host for *Schistosoma mansoni* in some areas of southern Brazil) have shown that these forms are not able to tolerate desiccation as well as *A. glabratus* from the Pernambuco area. It was found that the ability to survive out of water was still present in the fourth laboratory-bred generation of the *A. glabratus* strain while there was a marked deterioration of the resistance of the comparable generation of the *A. nigricans* strains. The authors point out that the evidence suggests that the ability to survive out of water for prolonged periods is genetically controlled.

C. A. Wright

BÉNEX, Jacqueline & LAMY, L. Immobilisation des miracidiums de *Schistosoma mansoni* par des extraits de planorbes. [**Immobilization of Miracidia of *Schistosoma mansoni* by Extracts of Planorbids**] *Bull. Soc. Path. Exot.* 1959, Mar.–Apr., v. 52, No. 2, 188–93.

Experiments were performed to determine the effects of aqueous extracts of various planorbid snails upon the viability of miracidia of *Schistosoma mansoni*. The extracts were prepared by removing the living snail from its shell and grinding in a mortar. After distilled water had been added, the extract was centrifuged and the supernatant used for experiment. The most satisfactory concentration was found to be 1:10 wt./wt. fresh snail tissue to water. Higher concentrations rendered interpretation of results difficult. The

snails used were *Planorbis corneus*, and 3 strains of *Australorbis glabratus* (Brazilian, Pointe-à-Pitre and Caribbean). The miracidia were of a Caribbean strain of *S. mansoni* bred in the laboratory in the appropriate snail. In previous laboratory experiments only the Caribbean strain of *A. glabratus* proved to be a suitable vector for the Caribbean strain of *S. mansoni*.

Incompatibility of strain was matched by degree of immobilization of miracidia. Immobilization effects were: *P. corneus* extract $\frac{1}{4}$–$\frac{1}{2}$ hour; *A. glabratus* Brazil $\frac{1}{2}$–$\frac{3}{4}$ hour; *A. glabratus* Pointe-à-Pitre, all alive at 1 hour but some miracidia were being slowly affected; *A. glabratus* Caribbean, all active for several hours. Fresh-water controls remained active; saline controls died in 5 minutes.

The authors conclude that the reaction observed was probably antigenic in character. *O. D. Standen*

HUBENDICK, B. **A Possible Method of Schistosome-Vector Control by Competition between Resistant and Susceptible Strains.** *Bull. World Health Organization*. Geneva. 1958, v. 18, Nos. 5/6, 1113–16. [Refs. in footnotes.]

The systematics of both schistosomes and of their snail vectors are unsatisfactory and, in addition to standard morphological methods, breeding experiments, serological techniques and paper chromatography should be used. Different strains of parasite and vector have evolved in separate, sometimes nearby areas, and such variation is an added complication.

Some snail strains are completely refractory to one strain of schistosome, for although they allow penetration, the parasite does not develop. Other snails of the same species and of the same apparent habitat support the development of the parasite but the life span of the vector and its reproductive capacity may be markedly reduced. Susceptible and refractory strains of snails living in water with schistosomes will undergo natural selection in favour of the resistant form. The introduction of a resistant strain to compete with a vector strain should be considered as a method of control, but much laboratory research on population genetics will be required. *W. E. Kershaw*

VOGEL, H. **Acquired Resistance to *Schistosoma* Infection in Experimental Animals.** *Bull. World Health Organization*. Geneva. 1958, v. 18, Nos. 5/6, 1097–1103. [Refs. in footnotes.]

Knowledge of acquired resistance to schistosomes, based as it is on animal experiments, is incomplete, but a general summary of the results of such experiments is given.

Mice and hamsters may acquire a resistance to reinfection with *Schistosoma mansoni*, *S. japonicum* and *Schistosomatium douthitti*, for in a second or subsequent infection fewer cercariae develop into the mature worms than after the initial infection, and in some instances the worms are stunted in growth [this *Bulletin*, 1953, v. 50, 131], provided that the immunizing infection is allowed to act for a month or more. Repeated infections seem to produce a more intense resistance than a single infection.

Resistance is acquired by rhesus monkeys to *S. mansoni* [*ibid.*, 1950, v. 47, 552] and *S. haematobium* [*ibid.*, 1954, v. 51, 1270] infections; the excretion of eggs ceases after several months or falls to a very low level. On exposure to reinfection, the excretion of eggs is neither renewed nor increased.

Resistance can be acquired by monkeys to infection with *S. japonicum* [*ibid.*, 1954, v. 51, 409]. Exposure for the first time to large numbers of cercariae (800–1,500) of both sexes causes a dysenteric illness with the excretion of large numbers of eggs and is fatal. Initial infection with 200–400 cercariae of both sexes produces no obvious illness and a moderately high egg excretion. Exposure of such monkeys to gradually increasing doses of cercariae at 8-month intervals produces a resistance to further infection in which fewer eggs are passed, and such eggs as appear do not hatch. Finally, exposure to a number of cercariae which would be fatal in uninfected animals causes egg excretion to cease.

Animals exposed to numerous weak infections closely following one another acquire a strong resistance to weak and strong super-infections.

Monkeys which show complete resistance to super-infection with *S. japonicum* harbour small numbers of male and female worms which are smaller than normal, and whose egg production is markedly reduced. This immunity to further infection is apparently independent of living worms, since it persists for years after treatment. It seems likely that a large proportion of the young parasites which pass through the skin of immune animals is destroyed while travelling to the lungs or in the lungs themselves.

Unisexual infections can produce a complete resistance to bisexual infections suggesting that the deposition of eggs does not play an essential part in the production of immunity.

[This article gives the experimental data in great detail, and the important references.] *W. E. Kershaw*

ANANTARAMAN, M. **On Schistosome Dermatitis: I. Dermatitis in India caused by Cercariae of *Schistosoma spindale* Montgomery, 1906.** *Indian J. Helminthology*. 1958, Mar., v. 10, No. 1, 46–52, 2 figs. on 2 pls. [28 refs.]

Dermatitis in man attributed to *Schistosoma spindale* is described in 3 out of 4 persons exposed to water containing schistosome cercariae emitted by wild *Indoplanorbis exustus* collected from a tank in Madras.

The morphology of the cercariae was compatible with that of *S. spindale*, *S. nasale* and *S. indicum* and 2 goats were exposed to infection by drinking water containing hundreds of cercariae for 10 days. 7 months later, numerous *S. spindale* were recovered from the portal and mesenteric veins and no *S. nasale* were found in the nasal tissues.

Since *S. spindale* is a common blood fluke of ruminants, the author wonders how common is schistosome dermatitis in the rural population of India.

[See also this *Bulletin*, 1939, v. 36, 40.] *W. E. Kershaw*

See also p. 630, KAIPAINEN & OHELA, **The Effect of Intrinsic Factor on the Schilling Test in Pernicious Tapeworm Anemia.**

KLEEVENS, J. W. L. & DE HAAS, R. A. **A Case of *Hymenolepis nana* in Netherlands New Guinea.** *Trop. & Geograph. Med.* Amsterdam. 1959, Dec., v. 11, No. 4, 376–7.

"Ova of *Hymenolepis nana* were found in the stools of a 4-year-old Papuan boy in Netherlands New Guinea; the patient had no complaints. A description is given of the ova.

"As far as known, this is the first report on the occurrence of this cestode in a native of New Guinea."

SCHILLER, E. L. **Experimental Studies on Morphological Variation in the Cestode Genus *Hymenolepis*. IV. Influence of the Host on Variation in *H. nana*.** *Exper. Parasit.* New York. 1959, Dec., v. 8, No. 6, 581–90, 2 figs.

PHIFER, K. **Permeation and Membrane Transport in Animal Parasites: the Absorption of Glucose by *Hymenolepis diminuta*.** *J. Parasitology.* 1960, Feb., v. 46, No. 1, 51–62, 10 figs. on 2 pls. [16 refs.]

SHAFEI, A. Z. **Clinical Trials on a New Taeniacidal Drug: 2,2′Dihydroxy-5,5′Dichloro-Diphenyl Methane.** *J. Egyptian Med. Ass.* 1959, v. 42, No. 8, 488–92.

The author, in Alexandria, treated 39 patients suffering from taeniasis and 30 from *Hymenolepis nana* infection with Dichlorophen [this *Bulletin*, 1959, v. 56, 747]. 12 of the first group and 14 of the second also harboured *Ascaris*; this worm was unaffected by the treatment. The drug was given in tablet form at a dosage of 0·5 gm./7 kgm. body weight in divided doses on a single day. Where the infection persisted or relapsed, the course was repeated after 2 weeks. Stool examination was followed up for 6 months.

All but 12 patients (with taeniasis) were treated without initial fasting or purgation. A table indicates that 22 of the 27 patients with taeniasis so treated were cured after the first course and 3 after a second: the figures for the 30 patients with *Hymenolepis* were 21 and 5. Relapses of taeniasis when they occurred arose at an average of 3·7 months and in *Hymenolepis* infection at 1·5 months.

Of the 12 patients having initial restriction of the diet to fluids and purgation 11 are stated to have been cured. No serious side effects were noted. *H. J. O'D. Burke-Gaffney*

FAVEZ, M. & RAGHEB, M. **Gastroscopy in Ancylostomiasis.** *J. Egyptian Med. Ass.* 1959, v. 42, No. 9, 505–8.

The authors, from Cairo University, performed X-ray examination of the stomach, fractional test meals and gastroscopy on 20 selected adult males suffering from severe ankylostomiasis with no evidence of other endemic disease.

The results are discussed and the findings for the test meals are tabulated. Excess of mucus was found in all, total acidity was markedly reduced in all and free acid was absent in 15. Gastroscopy showed characteristic signs of atrophic gastritis, which are listed. It is suggested that these findings may explain the gastro-intestinal symptoms encountered in ankylostomiasis. It is added that such uncomplicated cases are not commonly seen in rural areas in Egypt, as usually the patient suffers from multiple parasitic disease and malnutrition. *H. J. O'D. Burke-Gaffney*

Abdallah, A. & Saif, M. **The Trial of N-(B-Oxyethyl)-N-[P-Phenoxy (1'-Nitro)-Benzyl] Dichloroacetamide in the Treatment of Ancylostomiasis.** *J. Egyptian Med. Ass.* 1959, v. 42, No. 10, 574–7. [10 refs.]

The drug was without effect in 15 patients [see also this *Bulletin*, 1957, v. 54, 186].

Pereira Lima, J. & Roithman, N. Estrongiloidíase. Considerações clínico-laboratoriais e radiológicas. [**Strongyloidiasis**] *Hospital.* Rio de Janeiro. 1959, Sept., v. 56, No. 3, 461–87, 6 figs. [35 refs.] English summary.

A full study of 62 cases.

Mazzotti, L. Salida de hembras parásitas adultas de *Strongyloides stercoralis* con las materias fecales de pacientes tratados con Ditiazanina. [**Elimination of Female Adult *Strongyloides stercoralis* in the Stools of Patients treated with Dithiazanine**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1959, June, v. 19, No. 2, 123–7. English summary (2 lines).

The worms were found in 4 patients.

Jackson, G. J. **Fluorescent Antibody Studies of *Nippostrongylus muris* Infections.** *J. Infect. Dis.* 1960, Jan.–Feb., v. 106, No. 1, 20–36, 28 figs. [24 refs.]

Hacig, Alice & Solomon, Paula. Contribution à la sérologie des helminthiases. I. La préparation d'antigènes vermineux et de sérums immuns homologues. II. Les réactions antigène-anticorps *in vivo* et *in vitro* exécutées avec des antigènes d'helminthes et les sérums immuns respectifs. [**Contributions to the Serology of Helminthiases. I. Preparation of Worm Antigens and of Homologous Immune Sera. II. Antigen-Antibody Reactions *in vivo* and *in vitro* performed by means of Worm Antigens and the Respective Immune Sera**] *Arch. Roumaines Path. Expér. et Microbiol.* 1959, Mar., v. 18, No. 1, 107–22. [33 refs.]

I. Antigens were prepared with *Ascaris lumbricoides* from man and pig and with *Taenia saginata*. Different preparations were made involving saline

extraction, extraction in alcohol-ether, trichloracetic acid, washing in acetane followed by alcoholic extraction, and trichloracetic acid followed by alcoholic extraction.

Immune bodies were produced in rabbits by intraperitoneal and intravenous injection of the antigens.

The antigens were non-toxic, produced antibodies and could withstand long storage.

II. Allergic skin tests were done in 6 rabbits and 42 children most of whom were parasitized by one or more of the following worms; *Ascaris*, *Trichocephalus*, *Hymenolepis*, *Enterobius* and *Taenia*. All the worm carriers gave a positive cutaneous reaction, but of 13 children in whom no evidence of infection with helminths was found, 6 gave positive reactions.

Precipitation and complement-fixation reactions showed cross reactions between the antigens and sera derived from both groups of worms.

W. E. Kershaw

Soresco, Angela & Panaitesco, D. Contribution à l'étude du diagnostic immunobiologique de l'ascaridiose par la méthode de la microprécipitation sur les larves vivantes (Leikina). [**A Contribution to the Study of the Immunobiological Diagnosis of Ascaridosis by the Microprecipitation Method on Living Larvae (Leikina)**] *Arch. Roumaines Path. Expér. et Microbiol.* 1958, Sept.–Dec., v. 17, Nos. 3/4, 553–62, 3 figs. [28 refs.]

When unsheathed living *Ascaris lumbricoides* larvae were incubated at 37°C. with serum from an animal infected with *Ascaris*, microprecipitates occurred at the extremities. The live larvae were recovered by a Baermann technique from the lungs of animals such as guineapigs after ingestion of embryonated eggs.

Specific antibodies appeared in the serum of guineapigs on the 5th day after ingestion of large numbers of embryonated eggs, and precipitates occurred at the anterior ends of the larvae 8–24 hours after incubation with the serum, and at the posterior ends some 12 hours later. In 60% of the larvae around which precipitates occurred anteriorly, no precipitates occurred round the posterior extremity.

W. E. Kershaw

Valcarcel, Marta I. & Ramos-Oller, A. **Surgical Complications of Ascariasis.** *Bol. Asoc. Med. de Puerto Rico.* 1959, Sept., v. 51, No. 9, 313–19, 2 figs.

The authors base this paper on 31 cases of ascariasis with surgical complications which occurred in the 4 years between August 1954 and 1958 in the San Juan City Hospital, Puerto Rico. The ages ranged from 2 to 9 years and 16 were males.

All these children showed the clinical features of acute intestinal obstruction, and all but 2 had passed the worms *per rectum*. 8 children had received an anthelmintic (diethylcarbamazine) within 24 hours of the onset of the symptoms. In 14 children there was a palpable mass, described as non-tender, moveable, elongated and of a doughy or soft consistency situated most often in the right lower abdominal quadrant.

The laboratory tests showed that 22 children had a white cell count of over 12,000 per cmm., but only 4 had eosinophilia. Flat plate X-rays of the abdomen revealed the presence of the worms in 9 cases out of 15 children so examined.

The management of all patients consisted of giving intravenous fluids and parenteral antibiotics and they were placed on Wangensteen suction. 22 children did not require surgical intervention, and responded to this regime, within 24 hours. The other 9 children were operated upon within 6 hours of admission, and in these appendicectomy was performed in all but one, and in this other patient 12 inches of ileum were resected. In 5 of the 9 cases the appendix was found to be blocked with worms and perforated. In 2 a mass of worms was causing small intestine obstruction, and in 1 a large intestine obstruction. In the last case, the obstruction had led to gangrene of the small intestine.

All 9 children had an uneventful post-operative course except one who developed a wound abscess. 14 received anthelmintic treatment while still in hospital after recovering from the obstructive symptoms, and the rest were referred to the out-patient department for treatment. 3 patients died, 2 on admission and the third who had a bronchopneumonia complicating the obstruction.

The authors think that a definite relationship has been found between the administration of certain anthelmintic drugs and the development of intestinal obstruction. They also consider that radiological evidence is of major importance in the diagnosis. Most patients respond to medical treatment and they find the decision as to the need for surgical intervention to be often difficult, and think it should be made earlier rather than later. They do not agree with the practice of instituting anthelmintic treatment by a nasogastric tube in the presence of acute intestinal symptoms. *J. R. Rose*

Amato Neto, V., Coelho Neto, A. da S. & Bassoi, O. N. Reação alérgica à Piperazina. A propósito de dois casos. [**Allergy to Piperazine. (Report of Two cases)**] *Hospital*. Rio de Janeiro. 1959, Sept., v. 56, No. 3, 453–6. English summary.

Iwanczuk, Irena & Dozanska, Wiera. Badania nad wpływem różnych związków chloru czynnego na przeżywalnośc jaj *Ascaris* w zależności od pH i potencjału oksydacyjno-redukcyjnego. [**Results of the Research concerning the Influence of Various Compounds of Available Chlorine on the Survival of the Eggs of *Ascaris* in relation to *p*H and the Oxidation-Reduction Potential (ORP)**] *Roczniki Państwowego Zakladu Hig.* Warsaw. 1959, v. 10, No. 6, 547–57. [16 refs.]

The English summary appended to the paper is as follows:—

"Research leads to the following conclusions:

"1. pH and ORP play the crucial role in destruction of the eggs of *Ascaris* and, hence, of the eggs of other human worms.

"2. The parameters mentioned above are inversely proportional to each other, but show the slight relation for the compounds themselves to their concentrations.

"3. All studied compounds can be divided into two groups on the basis of their ovicidal action in relation to pH and ORP:

"a) compounds of low pH and high ORP (chlorine water and chlorine dioxide) that show the strong ovicidal action;

"b) compounds of high pH and low ORP (hypochlorites of calcium and sodium, chlorinated lime, and chloramine T) that are characterized by weak or no influence on the eggs mentioned.

"This indicates that it is aimless to use the available chlorine compounds for inactivation of worm's eggs in the external environment, as it was practised on a large scale up to date, because of the following reasons:

"a) the necessity of using extremely high concentrations in comparison with the bactericidal doses,

"b) easy hydrolysis of those compounds in the external environment,

"c) a too long time of ovicidal contact."

RAHMAN, J., SINGH, M. V. & SHRIVASTAVA, R. N. **Filariasis in Bahraich Town (Uttar Pradesh).** *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1959, Mar., v. 7, No. 2, 53–63, 1 map.

Wuchereria bancrofti infection was said to have been unknown in the town of Bahraich in Uttar Pradesh [the old United British Provinces of India] 60 years ago; a few cases appeared 25 years ago but the disease did not develop in truly endemic form until 15 years ago. The environment is clearly favourable for the maintenance of the vector, *Culex fatigans*, in which the authors have demonstrated an infection rate of 0·9%. The town, of some 45,000 inhabitants, has an equable climate with a temperature range of 48–90°F. and an annual rainfall of 34–60 inches, the bulk of which occurs between June and September, during which period the relative humidity may rise from the usual figure of 70% to over 90% There is no organized drainage, and sullage water, collecting in ponds and sluggish streams, provides an abundance of mosquito breeding sites. A further epidemiological factor of considerable importance is that the town is a focus of an annual religious pilgrimage.

A night blood survey, covering 9·2% of the population, was carried out between 20.00 and 24.00 hours, and the subjects, from each of whom 20 cmm. [printed in error as 20 cm.] of blood was obtained, were also examined for evidence of clinical filariasis. A mean incidence of microfilaraemia of 6·09% was discovered, the highest figure of 6·96% being in the 21–30-year age-group, after which there was a slow decline. The youngest infected subject was a child 1 year old, who showed a hydrocele. The mean microfilarial density was 10·2 per 20 cmm. of blood, the heaviest infection representing 78 microfilariae per 20 cmm.

7·6% of those infected showed clinical filariasis. Hydrocele and other genital changes were the commonest manifestations, but lymphoedema of the legs (11·8% right, 15·2% left), lymphoedema of the upper limbs (5·7%) and chyluria (2·1%) were also observed.

The mean endemicity rate [presumably based on the sum of those showing microfilaraemia and of those with clinical signs but no microfilaraemia] was calculated to be 13·39%, with a maximum figure of 26·37% in those aged 50 years or more. Thus the endemicity is moderate. *J. H. Walters*

RAHMAN, J., SINGH, M. V. & SHARMA, K. L. **Pre-Control Survey in the Filaria Control Unit, Barabanki, U.P.** *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1959, July, v. 7, No. 4, 107–17, 1 map on folding pl. & 2 graphs.

The district has an area of 1,723 square miles of predominantly agricultural land. The total population is about 1,200,000 out of which only 83,000 people live in 10 towns and 1,117,000 in 2,054 villages. The area of Nawabganj Tehsil, with the exclusion of Zaidpur town area, with a population of 299,920, was selected as the area of control operations. In order to "check up", a special study area of 30,087 people was chosen together with a "comparison area" with a population of 31,256 consisting of Zaidpur town area and nearby villages.

The history of filariasis reveals that it had been imported into the district about 50–60 years ago.

4,957 blood samples were collected between 20.30 and 24.00 hours. The representative sample of the population tested was about 15%. The infection rate was found to be 10% and the average density of *Wuchereria bancrofti* was 14·3 per 20 cmm. The youngest person infected was a child of 2.

The filarial disease rate was 3·1%. The youngest patient was a boy of 6, with hydrocele. Out of the total of 154 cases of filarial disease there were 112 males and 11 females over 20 years old and 27 males and 4 females under 20 years old. The commonest manifestations were genital; the next commonest was elephantiasis of the lower limbs. As elsewhere the infection rate rose with age, so that it was found to be highest in the age-group 31–40 and then declined. The disease rate followed the same lines.

Out of 11,785 mosquitoes collected between April 1957 and March 1958, 10,905 were *Culex fatigans*, which is undoubtedly the vector in this area (out of 4,811 dissected 81 contained filarial larvae). Findings in the "comparison area" were very similar. *Philip Manson-Bahr*

BHATIA, M. L. & WATTAL, B. L. **Tolerated Density of *Culex fatigans* Wied in Transmission of Bancroftian filaria.** *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1958, July, v. 6, No. 4, 117–22. [10 refs.]

In the epidemiology of vector-borne diseases, "critical density" of the vector is defined as the minimum level at which transmission can take place. "Tolerated density" on the other hand is defined as the highest limit of density of the vector up to which there is no risk of transmission [this *Bulletin*, 1959, v. 56, 414]. The authors have attempted in this paper to arrive at tolerated density of *Culex fatigans* for *Wuchereria bancrofti*, by comparing the density figures in non-filarial and filarial areas of India, during the transmission season. In the endemic areas of Bengal and Orissa, the average monthly density per 10 man-hours during the transmission season was 51·7 and 53·9 respectively, while in the non-filarial areas of Delhi and the Punjab the figures were 13·4 and 33·9 respectively. On the basis of these data, the authors conclude that a density of 34·0 per 10 man-hours is the level below which no filarial transmission is possible. *M. G. R. Varma*

GALLIARD, H. Filaires nouvelles du type *bancrofti-malayi* chez l'homme et l'animal dans l'aire Afrique Orientale-Océan Indien. [**New Filariae of the *bancrofti-malayi* Type in the Area of East Africa and the Indian Ocean**] *Bull. Soc. Path. Exot.* 1959, Sept.–Oct., v. 52, No. 5, 578–82, 1 fig. [11 refs.]

In a review of recent developments in filariasis [this *Bulletin*, 1956, v. 53, 349, 1156; 1957, v. 54, 592, 730; 1958, v. 55, 1262; 1959, v. 56, 960], as illustrated by the *Brugia* [*Wuchereria*] *malayi* group, the author gives a contemporary picture, especially with regard to the new species discovered on the south-east coast of Madagascar, now known as *Wuchereria bancrofti* var. *vauceli* [*ibid.*, 1956, v. 53, 782] of which the microfilaria is halfway between that of *W. bancrofti* and *W. malayi*. Unfortunately, the adult form has not yet been found. There is a suggestion that it might represent *Dipetalonema petteri* Chabaud and Choquet 1955, a parasite of lemurs, the microfilaria of which resembles *vauceli*. [No mention is made of a sheath in this instance.]

Its geographical distribution is limited and quite peculiar, suggesting some local factor. This factor is discussed further in relation to the general question of the finding of filarial parasites of the *W. malayi* type in limited foci in the Indian Ocean area. *Philip Manson-Bahr*

EDESON, J. F. B. **Studies on Filariasis in Malaya: the Accuracy of Blood Surveys.** *Ann. Trop. Med. & Parasit.* 1959, Dec., v. 53, No. 4, 388–93.

When a series of blood films was examined by 4 different persons there was a reasonable degree of agreement, but some very low infections were missed by one or more observers. The only real conclusion which could be drawn from these results was that, where series of counts are compared, the observations should be made by the same person.

When blood was taken from different digits the counts were in fair agreement, but it did appear that there were fewer microfilariae in films taken from the thumb; this may have been due to the greater amount of squeezing necessary.

It has already been shown that the microfilariae are markedly nocturnal in their periodicity in Penang [this *Bulletin*, 1958, v. 55, 293]. In 27 Penang carriers the total count at 11 a.m. was 28, while at 11 p.m. it was 2,414 (86 times greater), but the nocturnal increase of microfilariae in East Pahang is less marked, the total noon count in 20 human carriers being very nearly the same as the total midnight count.

Among 28 persons in East Pahang from whom blood films were taken between 9 a.m. and 2 p.m. and between 9 p.m. and 10 p.m. on the same day, microfilariae were found in both sets of films. The total day-time counts were about half the total night-film counts.

To determine the day-to-day variation in microfilaria counts, 13 carriers were examined at 9 p.m. each evening for one month. The carriers were all infected with the semi-periodic form of *Brugia* [*Wuchereria*] *malayi* and blood films were made from 60 cmm. of blood. One was recorded as negative 26 times, but films on two occasions contained one microfilaria: another, with

the highest count of 9, was recorded as negative twice out of 29 examinations. In the remaining 11 there was a considerable—and irregular—variation.

A comparison was made between films made from 20 cmm. and from 60 cmm. of blood. In examination of hospital patients receiving diethylcarbamazine treatment 60 cmm. films were made first, then a further 20 cmm. were withdrawn from the same puncture: in another series, a 20 cmm. film was made first and then a further 60 cmm. were withdrawn. Both sets of films were always positive when the total count in the 80 cmm. of blood exceeded 12 microfilariae.

Tabulated figures for films showing 12 microfilariae or less per 80 cmm. suggest that, wherever microfilarial densities are low, less than half the microfilaria carriers will be revealed by a single 20 cmm. film, while a 60 cmm. film may reveal about 90% of carriers found by examining the whole 80 cmm. of blood.

In surveys of East Pahang in 1953 (3,906 people) the proportion with low filarial densities was 7% in a population with a total microfilaria rate of 41%. Had 60 cmm. of blood been examined instead of 20 cmm. one may suppose that the microfilaria rate might have been raised to 52%. In 3 field surveys of small populations 60 cmm. of blood were collected from each person and spread into three films, each of 20 cmm. The proportionate increase in the microfilaria-carrier rate resulting from examination of larger amounts of blood was considerably greater where microfilarial density was low.

In conducting a filariasis survey in Malaya, children of all ages must be examined.

The examination of more than 20 cmm. of blood may not affect the carrier rate in an untreated endemic area, but, where mass treatment has been given, the carrier rate may be increased by 25% or more if 60 cmm. blood films are examined. *Philip Manson-Bahr*

NAIR, C. P. & RAY, A. P. **"Simazin" as a Weed Killer against** *Pistia stratiotes*. [Research Notes.] *Bull. Nat. Soc. India for Malaria & other Mosquito-Borne Dis.* 1959, Mar., v. 7, No. 2, 65–6.

Mansonia annulifera, vector of *Wuchereria malayi*, lays eggs on the under surface of the leaves of the aquatic weed *Pistia stratiotes* and the larvae and pupae attach themselves to its free floating rootlets. Manual removal of the weeds is expensive and impracticable in extensive tracts, so the authors, from the Malaria Institute of India, made field trials with the weed killer Simazin (Geigy) in Ernakulam, Kerala State, between November 1957 and May 1958. They chose 20 ponds having a water surface of 15 to 200 square yards. *Pistia* was present in all and, in addition, 7 contained grass at the edges and 2 harboured *Colocassia* sp. The density of *Pistia* ranged from 198 to 272 per square yard.

The formulation was made by mixing 8 oz. by weight of the 50% water wettable powder of Simazin with 2 gallons of water. 1 gallon of this, sprayed by a hand compressor over an area of 100 sq. yd., was approximately the same dosage as the 10 to 15 kgm. per hectare recommended. The plants in the centre received the same dosage as those at the edges. Untreated control ponds were studied throughout.

From the second and third days after spraying, many of the plants lost their freshness, appeared less green and tended in some cases to become greyish. The tips of the leaves gradually curled and the buds dried up, but the roots did not seem to be affected. By the fourth day, the water appeared to be oily and young leaves dried up: in older plants, only the edges were affected. As the plants died, they sank gradually and disappeared in 6 to 16 days. There was no smell and an initial slight scum disappeared within a few days to a month. In 2 cases, the water turned yellowish brown, but cleared in a month. No regrowth of *Pistia* occurred in the treated ponds during the 6 months' period of observation: this period could not be extended, as at that time of year *Pistia* plants tend to drift in the storm waters of the monsoon.

The grass on the edges of the pond dried up concurrently, but no effect of the weed killer was noticed on *Colocassia*, or on frogs, fish, or aquatic insects present in the ponds. There was little change in the density of *Pistia* in the control ponds. *H. J. O'D. Burke-Gaffney*

CREWE, W. & GORDON, R. M. **The Immediate Reaction of the Mammalian Host to the Bite of Uninfected *Chrysops* and of *Chrysops* infected with Human and with Monkey *Loa*.** *Ann. Trop. Med. & Parasit.* 1959, Sept., v. 53, No. 3, 334–40, 1 pl.

Observations are reported which demonstrate that not only can an immediate wheal reaction to the bite of uninfected *Chrysops* occur in a person sensitized by previous experiences of being bitten by them, but a more severe wheal results from the inoculation of *Loa* larvae by the bites of infected *Chrysops*. It appears that, besides the sensitization stimulated by salivary fluid, additional sensitization develops after previous infection with the helminth and is evoked at subsequent transmission of infective larvae by *Chrysops*.

Experiments are described in which uninfected *Chrysops*, and *Chrysops* infected with human or monkey *Loa*, were allowed to bite mandrills and an African volunteer with, at least so far as possible, known histories of exposure to infection with loiasis and responses to infective or uninfective bites or both. Wheal reactions to uninfected flies were considerably smaller and less persistent than those to infected flies, whether transmitting human or monkey *Loa*. This is illustrated for the African by a series of comparative photographs. The allergic wheal lasted no longer than about 24 hours, although general irritation and oedema of the bitten area (the forearm) persisted for up to 14 days. Delayed reactions of a papular nature have not usually been observed. But one African is known to have developed scattered wheal-like swellings over the bitten forearm. Whether these are flare-ups of former bites or mark the presence of larvae killed by the defensive mechanisms of the host remains to be investigated. These intense immediate wheal reactions to invasion of infective larvae may account for persons infected with *Loa* in loiasis areas reacting particularly severely to only some *Chrysops* bites, presumably those of infected flies actively transmitting the worms.

The possibility of using sensitization responses to test if human beings or monkeys harbour human or simian *Loa* is briefly mentioned.

[See also this *Bulletin*, 1949, v. 46, 514; 1950, v. 47, 1214.]

D. S. Bertram

Janssens, P. G., Van Bogaert, L., Tverdy, G. & Wanson, M. Réflexions sur le sort des microfilaires de *Loa loa* dans l'organisme humain parasité. Manifestations viscérales provoquées par leur infiltration dans les tissus. [**Reflections on the Fate of Microfilariae of *Loa loa* in the Human Organism. Visceral Manifestations provoked by their Infiltration into the Tissues**] *Bull. Soc. Path. Exot.* 1958, July–Aug., v. 51, No. 4, 632–45. [Numerous refs.]

i. Rodenburg, W. & Wielinga, W. J. Eosinofiele flegmone van de dunne darm, veroorzaakt door een worm. [**Eosinophile Phlegmon of the Small Intestine due to a Worm**] *Nederl. Tijdschr. v. Geneesk.* 1960, Feb. 27, v. 104, No. 9, 417–21.

ii. Kuipers, F. C., Van Thiel, P. H. & Roskam, E. T. Eosinofiele flegmone van de dunne darm, veroorzaakt door een niet aan het lichaam van de mens aangepaste worm. [**Eosinophile Phlegmon of the Small Intestine due to a Worm not Normally Parasitic in Man**] *Ibid.*, 422–7, 5 figs.

The English summaries appended to the papers are as follows:—

i. "A hitherto unknown syndrome, an acute phlegmonous inflammation of the ileum wall caused by a recently identified parasite, is reported at length. A total of 11 cases, mainly in or near Rotterdam, have been observed in the last few years. The inflammatory process in the intestinal wall is allergic in character. The clinical picture shows some curious characteristics. Surgical treatment is indicated. Wide spectrum antibiotics should not be used in follow-up treatment. The prognosis is generally favourable."

ii. "Since 1955, 10 cases of an acute abdominal syndrome have occurred in Rotterdam-Schiedam and one in Hilversum. A surgically removed portion of the intestine (jejunum, ileum) was found to contain an eosinophile phlegmon enclosing a larva of *Eustoma* (= *Anacanthocheilus*) *rotundatum*. These nematodes are parasitic in herring and are not adapted to the human body. In all cases the source of the infection was very slightly salted herring. Data regarding the occurrence of these larvae in North Sea herring, their behaviour in fresh and salted herring and their salt tolerance are presented. The distribution of the cases is found to be related to eating habits and changes in herring curing methods."

See also p. 658, Lewis & Garnham. **The Simuliidae (Diptera) of British Honduras.**

Miller, M. J. **An Evaluation of the Skin Scarification Technic for the Recovery of Microfilariae of *Onchocerca volvulus*.** *Amer. J. Trop. Med. & Hyg.* 1958, Sept., v. 7, No. 5, 554–7.

A skin scarification smear for the diagnosis of infection with *Onchocerca volvulus* has been used at the Liberian Institute of the American Foundation of Tropical Medicine to determine the relevance to diagnosis of the anatomical region chosen for the scarification, the number of smears needed to give significant results, the variations in different smears taken simultaneously from the same anatomical region, the variations in smears repeated in different days

from contiguous sites, and the efficiency of this technique compared with that of skin biopsy.

5 superficial linear incisions were made with a razor blade 1 mm. apart and 1–2 mm. long, and blood and tissue juices were expressed by the fingers, collected onto a slide as a thick smear and stained with Giemsa stain, and, if necessary, later by haematoxylin.

This technique showed the highest microfilarial recovery rates in the hips and lower extremities, as was shown by KERSHAW *et al.* in 1954 [see this *Bulletin*, 1954, v. 51, 1279] with skin biopsy in Nigeria. In light infections, smears made from scarifications may show microfilariae in but one of 6 smears made simultaneously from the same anatomical region, and for diagnostic purposes it is advisable, in Liberia at least, to make a minimum of 4 smears, one from each hip and calf. Wide variations in the numbers of microfilariae recovered from smears are due to limitations in the technique—to such factors as the length and depth of incision, and the amount of pressure used to express the tissue juices; this method is not, therefore, considered suitable for precise quantitative studies, but can be used for a rough measure of the microfilarial density and distribution. *W. E. Kershaw*

BROWNE, S. G. **Incidence and Clinical Manifestations of Onchocerciasis in a Focus in the Oriental Province of the Belgian Congo.** *Ann. Trop. Med. & Parasit.* 1959, Dec., v. 53, No. 4, 421–9, 1 fig.

Onchocerciasis has for many years been known to exist in the Oriental Province of the Belgian Congo, but the importance of scattered foci is not fully appreciated.

The incidence and clinical manifestations of the disease are recorded in the Yakusu sector. The district is situated between 23° and 25° east and just north of the Equator, astride the Congo river, where there is a slight seasonal variation in rainfall, temperature and relative humidity. The river Congo is joined at this point by considerable tributaries—the Lindi-Chopo and Lomami rivers.

During a detailed pilot survey of a focus of high onchocercal endemicity the opportunity was taken to train auxiliary personnel in clinical, pathological and relevant entomological examinations. These onchocerciasis teams were led by a qualified *infirmier* and were instructed to record the presence and situation of onchocercomata, the degree of onchodermatitis and characteristic depigmentation. Blood counts were made of each inhabitant.

It was concluded that a higher proportion of positive cases is discovered when a skin-snip is teased, immersed in saline, and the deposit examined after centrifugation, than when it is examined at once. More microfilariae are seen in snips immersed in saline at 80–85°F., allowed to dry and then stained with dilute Giemsa. Skin-snips are more likely to furnish positive results than dermal lymph obtained by puncture. Snips from sites adjacent to onchocercomata, from the pelvic girdle, thigh and calf, are more often positive than those obtained from the upper trunk and arms. The proportion of positive findings and numbers of microfilariae remain unchanged in altered conditions of light and temperature.

Onchocercomata in unusual sites where confusion with juxta-articular nodules was likely to arise were subjected to diagnostic puncture.

There were two principal foci of onchocerciasis (Bokuma and Bembelota) and two secondary foci (Forest Foma and Luete). In central villages nearly all adults were infected. There were 7,781 cases of onchocerciasis in 45,035 people, with an overall percentage of 17·3. Diagnosis was made on the presence of onchocercomata in 77% and on the presence of dermal microfilariae in the remainder. No dermal microfilariae could be found in two skin-snips in 17% of subjects with palpable onchocercomata. (*Acanthocheilonema streptocerca* was rarely found.)

In districts of high onchocercal endemicity 48% of persons with no palpable onchocercomata had dermal microfilariae. In such districts onchocercomata were present and palpable in 82% of adult males, in 57% of adult females, and 26% of children. Fewer females were affected than males, but the general pattern of incidence was the same. The earliest age at which they were found was in a child of 12 months in a hyperendemic focus: onchocercal microfilariae were seen in the dermis of a child of 6 months.

5,989 persons with onchocercomata had on the average 1·57 sites affected and 1·61 distinct nodules at each site, giving an average of 2·52 palpable onchocercomata for each individual.

In localization the greatest number of onchocercomata were found in the pelvic girdle and vicinity, to a lesser degree in the shoulder girdle and vicinity, and least on the head.

The chronic characteristic condition known as filarial itch was present in a high proportion in the hyperendemic villages and in addition the following were noted:—(1) localized cutaneous reactions to the bites of *Simulium*, (2) an acute urticarial reaction, (3) acute generalized septic dermatitis, (4) slightly raised oval plaques, brownish-purple in colour, scattered over the skin especially on the anterior aspect of the middle third of the thighs, resembling *mal de morado* of South America.

In villages of the highest endemicity a characteristic depigmentation at sites of predilection was observed in patients who had long harboured onchocercomata, who had been subjected to *Simulium* bites for years, and who had inguinal lymphadenopathy. These sites are listed.

Eye lesions were found only in hyperendemic villages. Accurate examination was aided by a simple and very practical instrument, the Foster Schurr hand slit-lamp with a corneal magnifying attachment movable on a curved arm. As in other surveys, many non-onchocercal eye conditions of diverse aetiology were encountered.

Among 1,026 subjects with onchocerciasis 85 had serious eye lesions which were attributable to the disease. On the whole they were older than the average onchocerciasis patient; they had twice the number of sites affected by onchocercomata and more tumours at each site; an interesting phenomenon was that longstanding onchocercal infection, with hypersensitization phenomena and lymphadenopathy, was four times as great as in the general population with onchocerciasis; and the incidence of specific onchocercal depigmentation was more than 10 times as great in those with eye lesions attributable to onchocerciasis.

Apart from the common fluffy points in the inferior segment of the cornea, larger opacities were found in 38 patients. Marked corneal lesions were present with minimal visual disturbance.

A fibrous mass was seen in the lower pole of the anterior chamber on 6 occasions, and living microfilariae twice in the aqueous (with the slit-lamp).

In 61 patients there was evidence of iridocyclitis, past or present. The majority showed the " pumice-stone " iris.

26 had posterior-segment lesions, a choroidoretinitis characterized by heaped-up masses of pigment giving a tigroid appearance.

3 cases of optic atrophy were seen in patients with other advanced changes in cornea and iris.

The adenopathy in areas of high onchocercal endemicity consists of a chronic enlargement, fibrosis and matting together of lymphatic glands in the crural and inguinal regions. No immature microfilariae were found on puncture.

The cases were classified according to the degree of enlargement, including the " hanging groin " in males and females and the " pseudo-Hottentot apron " in females. There was a positive correlation between the degree of glandular enlargement and the severity of onchodermatitis.

The role of onchocerciasis in the production of elephantiasis in the districts of high onchocercal endemicity was also investigated and only 2 cases of gross elephantiasis of the legs were found. On the other hand, there was a characteristic elephantiasis of the fundus of the scrotum. *Simulium neavei* was found with ease in the vicinity of the 2 principal foci. 5% of adult flies caught on human bait contained developmental forms of *Onchocerca volvulus*.

Philip Manson-Bahr

BROWNE, S. G. **Neoplasms of the Skin associated with Onchodermatitis.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1959, Nov., v. 53, No. 6, 506–10, 4 figs.

Long standing onchocerciasis is known to be associated with xeroderma and lichenification mainly on the back and thighs, particularly over Scarpa's triangle. On these sites benign papillomatous tumours may occur. 2 cases are described, both in male Bantus aged about 40 and 25 respectively.

Histologically 2 tumours removed from the former patient showed typical papillomata with an intense infection of the dermis with onchocercal microfilariae and a moderate round-cell reaction.

A tumour removed from the second patient showed a papilloma with few onchocercal microfilariae in the immediate neighbourhood of the tumour cells although they were numerous in the subjacent stroma.

External mechanical irritation was thought to play a part in the production of all three tumours.

The paper is illustrated by 2 photographs and 2 photomicrographs.

H. T. H. Wilson

MAZZOTTI, L. Presencia de microfilarias de *Onchocerca volvulus* en el líquido cefalorraquídeo de enfermos tratados con Hetrazan. [**Presence of Microfilariae of *Onchocerca volvulus* in the Cerobrospinal Fluid of Patients treated with Diethylcarbamazine**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1959, Mar., v. 19, No. 1, 1–5.

The English summary appended to the paper is as follows:—

" Microfilariae of *Onchocerca volvulus* were found in the spinal fluid and

in the blood of 5 patients, during the first days of treatment with Diethylcarbamazine (Hetrazan)."

KALYANARAMAN, V. & ROW, M. V. J. *Oxyuris vermicularis* **Infection of the Eye.** *J. Indian Med. Ass.* 1960, Jan. 16, v. 34, No. 2, 61.

A case of direct conjunctival infection, in Hyderabad.

KOZAR, Z. **Problem of Trichinellosis in Poland and Plan of Control of this Invasion.** *Wiadomości Parazytologiczne.* Warsaw. 1959, v. 5, Nos. 2/3, 280–91. [Fuller version in Polish 265–80.]

A hundred years ago ZENKER identified *Trichinella spiralis* as the cause of a very serious illness in man, often having a fatal course, and though much has been done since then in some countries infection is a real problem. Infection occurs all over the world except Australia, commonly in North America, less commonly in South America, and rarely in Africa. A wave of infection passed over Europe during the last century, and now, Scandinavia, Belgium, Holland, France, Germany, Switzerland, Italy and Greece are practically free from human infection; infection in man persists commonly only in the Eastern parts of Europe—in a belt including Lithuania, White Russia, Eastern Poland, the Ukraine, Slovakia, Hungary, Rumania, Bulgaria and Yugoslavia.

In Poland, over 5,000 cases were recorded from 1945–57 with a gradual increase during the 13 years, probably the result of better diagnosis. In consequence of increased interest in the infection intradermal tests were done in the Białystok district on more than 2,000 persons, and 38% were positive; the reliability of these tests was supported by the wide variations in the incidence from place to place in the district, and in the district larvae were recovered from 13·5% of post mortem examinations on human subjects.

Poland has one of the highest infection rates in pigs in Europe, *i.e.* 0·0258%, and it occurs in dogs, cats, rats, red and breeding foxes, wild boars, and small forest animals, but information is too scanty to determine whether there is a wild animal reservoir for human infection. During the war, 4·6% of a sample of 4,000 dogs, and 20% of 350 cats in Warsaw were infected, but the numbers of rats examined were too small for interpretation.

In Poland, therefore, *T. spiralis* occurs commonly in animals, and in man; 1,800 carcasses of pigs are destroyed annually because of this infection, and the main source of infected pigs is the Białystok district, where it is 55 times more frequent than in all the other districts of Poland, and this can be related to the high incidence of infection in man. Accordingly, some 3 years ago, a campaign was started to control infection by establishing epidemiological stations to which cases of infection in man and in pigs were reported; thereby accurate information throughout the country could be obtained of dangerous endemic centres. It is hoped to encourage good animal husbandry and the slaughter of animals in premises where trichinoscopy can be carried out.

An international symposium is being organized in Warsaw on Trichinellosis in 1960, to mark the centenary of Zenker's discovery. *W. E. Kershaw*

LORD, R. A. **Studies on the Use of Cortisone and ACTH in Trichinosis.** *Amer. J. Trop. Med. & Hyg.* 1958, Nov., v. 7, No. 6, 611–17, 5 figs. [16 refs.]

No specific therapy is known for the treatment of trichinosis, but during the last 7 years corticotrophin and cortisone have been shown to alleviate the clinical symptoms [this *Bulletin*, 1952, v. 49, 531].

Corticotrophin and cortisone were used in infection in rats in the Department of Microbiology in the Yale University School of Medicine. The weight of the animal, the eosinophilia, the survival time, and the tissue response were followed through infection.

Corticotrophin reduced the loss of weight, decreased the mortality rate, and prolonged survival time, and slightly reduced the eosinophilia, but did not affect the tissue response. Cortisone seemed to have no beneficial effect, and was toxic in large doses; the reason for this difference in effect was not clear.

W. E. Kershaw

DEFICIENCY DISEASES

GUZMÁN BARRÓN, A. Deficiencia a las vitaminas B en el Perú. **[Vitamin B Deficiency in Peru]** *Archivos Venezolanos de Nutrición.* 1958, July, v. 9, No. 1, 81–103. [65 refs.] English summary.

A study in 3 groups showed a considerable deficiency in thiamine, riboflavine and nicotinic acid.

ROWLANDS, D. T., Jr. & VILTER, C. F. **A Study of the Cardiac Stigmata in Prolonged Human Thiamine Deficiency.** *Circulation.* New York. 1960, Jan., v. 21, No. 1, 4–12, 5 figs. [10 refs.]

"Eight patients with clinically recognizable chronic thiamine deficiency and beriberi heart disease were investigated from a pathologic point of view in an effort to establish the presence and the extent of characteristic morphologic stigmata. In these cases there were no pathognomonic cardiac alterations at necropsy. Individuals with cardiac failure of short duration and those with prolonged heart failure manifested identical pathologic lesions.

"It is concluded that beriberi heart disease is largely the result of a reversible biochemical abnormality and is not characterized by necrosis, fibrosis, or other irreversible damage to the myocardium, even after prolonged periods of cardiac failure."

KHATUA, S. P. **Deficiency Dermatoses of Children in the Tropics.** *Indian J. Dermat.* 1959, Oct., v. 5, No. 1, 7–15, 3 figs.

This paper reports a summary of the clinical findings in 324 children, most of them aged 6 months to 3 years, suffering from malnutrition, in Calcutta.

Other aspects besides the dermatological are considered. There was a high mortality rate—98 deaths. Gastro-intestinal infection was a precipitating factor in 85% of the children.

During the hot weather, April and May, the incidence was at a minimum, rose during the monsoon to a maximum in August and September and declined in the cold weather. The incidence of malnutrition in children in Calcutta thus appears to follow the same seasonal sequence as gastro-intestinal diseases. This observation is obviously of significance in public health. *R. Passmore*

MACDOUGALL, Lorna G. **The Haematological Picture in Kwashiorkor and Marasmus.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1960, Jan., v. 54, No. 1, 37–43. [27 refs.]

Deficiency of various haematinic factors, diarrhoea, infection, and hydraemia, have all been suggested as the cause of the anaemia of kwashiorkor. 8 African children with kwashiorkor, and 10 with marasmus, were investigated in Nairobi. Severe anaemia rarely occurred; Hb levels varied from 6·4 to 12·0 gm./100 ml. (average 9·4) in kwashiorkor, and from 8·6 to 12·8 gm./100 ml. (average 10·9) in marasmus. The MCHC in the two groups was 27–35%, and 29–33% respectively. The bone marrow was normoblastic in all cases, though giant stab cells were seen in 2 kwashiorkor and 4 marasmic children, only one of whom had a MCV of over 100cμ. Serum B12 levels were measured at the Middlesex Hospital, and averaged 676 $\mu\mu$gm./ml. for the kwashiorkor and 341 $\mu\mu$gm./ml. for the marasmic children. No constant relation was found between the degree of anaemia and the total serum protein content.

In the author's small series, therefore, anaemia could not be ascribed to protein or B12 deficiency. The giant stab cells in the marrow disappeared on diet alone, and therefore any folic acid deficiency was minimal and inconstant. A new observation was that while the marrow myeloid/erythroid ratio was normal in kwashiorkor, it was increased to 4:1 in marasmus. Marasmic children appeared to benefit from chlortetracycline [this *Bulletin*, 1958, v. 55, 203]. It seemed therefore that the possible role of infection would merit further study. *Alan B. Raper*

NELSON, G. K. & DEAN, R. F. A. **The Electroencephalogram in African Children: Effects of Kwashiorkor and a Note on the Newborn.** *Bull. World Health Organization.* Geneva. 1959, v. 21, No. 6, 779–82, 2 figs. [Refs. in footnotes.]

The kwashiorkor syndrome is characterized by misery, mental dullness, anorexia and, in the ultimate state, by hopeless apathy. Though response to disturbance is usually a petulant resistance, sometimes a sudden violent emotional reaction is evoked.

Children with kwashiorkor show an impaired performance to standard intelligence tests, such as the Gesell, but this is rapidly reversed as interest and appetite return in response to treatment [this *Bulletin*, 1958, v. 55, 464]. Some studies on the electroencephalogram in this disease have already been

published from Algiers [*ibid.*, 1954, v. 51, 971], Ceylon and Italy, but these reports all lack comparison with normal controls. They have indicated a general depression of cortical activity, with abnormally slow and low voltage rhythms and an absence of response to photic stimulation (exposure to a flickering light).

The authors record an electroencephalographic study of 47 patients, whose ages ranged from 12 to 36 months, suffering from the kwashiorkor syndrome, who were under treatment in hospital at Kampala, Uganda, and in Johannesburg. All belonged to Bantu-speaking groups save one, who was of Nilotic origin. Serial records were obtained from 33 children: single records only from 14. 38 Bantu children, considered to be healthy or convalescing in surgical wards, were used as controls; 11 of these were tested more than once.

The most arresting finding was that in 36% of the children with kwashiorkor abnormal focal activity occurred in the temporal or post-temporal region, or (in 1 patient only) in the parietal region. This activity, as is usual, was more often found during sleep, though in 2 children it was constantly present. On general clinical improvement this abnormal focal activity disappeared in 2 but remained in 3 of 5 re-tested. The general depression in cortical activity, manifested by less voltage and slowed rhythmic discharges, was found initially. In 21 out of 28 patients on whom serial tracings were obtained an acceleration of normal rhythmic activity ran parallel with general improvement, but showed further slowing in the single child whose condition deteriorated. Photic stimulation produced a "normal" response in all the patients tested, but increased in amplitude, amount and range on recovery. A fourth point concerned the occurrence of runs of a fast (beta) rhythm, called "spindle activity", which occurs in normal persons during sleep. The unusually low incidence (63%) of such rhythms was observed in untreated patients with kwashiorkor, and of the 4 who were retested on recovery, no enhanced spindle activity was evident.

There was no correlation between the degree of oedema or anaemia and abnormality of the electroencephalogram, and non-kwashiorkor patients showing a similar degree of oedema or anaemia had normal tracings.

3 marasmic children were investigated as a contrast to the kwashiorkor syndrome group. These showed general depression of cortical activity of comparable degree, but no focal discharges.

During recovery from the kwashiorkor syndrome, the EEG tended to approximate more closely to that of healthy children, in parallel with the psychological improvement.

A further observation was that in a group of 8 African neonates the EEG changes appeared more mature than would be expected from experience of European infants of comparable age, and bore out the clinical impression of precocious psychomotor development exhibited by newly born African children.

It is considered that the abnormal focal activity exhibited by some children with kwashiorkor reflected a general state of increased intracellular, as well as extracellular fluid [or intracellular protein deprivation, or both], to which the temporo-parietal cortex may be particularly susceptible.

In conclusion the authors comment:—"We would do well to remember not only that kwashiorkor is profound in its immediate effects but that we know almost nothing of its long-term consequences". *J. H. Walters*

WILLIAMS, R. R. **Can we Eradicate the Classical Deficiency Diseases?** *J. Amer. Dietetic Ass.* 1960, Jan., v. 36, No. 1, 31–6, 3 figs.

This paper discusses nutrition surveys carried out, largely in military forces, in some 12 countries [see, for example, this *Bulletin*, 1960, v. 57, 164], the question of better farming and the enrichment of cereals with synthetic vitamins [*ibid.*, 1954, v. 51, 1088].

SPRUE

BUTTERWORTH, C. E., Jr., SOLER, J., SANTINI, R., Jr. & PEREZ-SANTIAGO, E. **Certain Aspects of Glycine and Histidine Metabolism in Patients with Sprue.** *Blood.* 1960, Jan., v. 15, No. 1, 60–70, 4 figs. [40 refs.]

7 patients in Puerto Rico with megaloblastic anaemia of sprue were given DL-serine by mouth in doses of 5 gm. twice daily, dissolved in water. The dose was continued for 7 days in 2 subjects, for 10 days in 4 subjects, and for 13 days in 1 other. During this period the patients were maintained on a traditional local diet, which is low in proteins and vitamins, and consists mainly of rice and beans.

The administration of serine produced a sub-optimal but definite reticulocytosis in 4, but a more equivocal response in 2 of the patients. The authors suggest that citrovorum factor was formed from tetrahydrofolic acid under the influence of serine. In 2 patients the urinary folic acid excretion was also followed, and was found to be normal during the period of serine therapy. 3 patients with sprue were found to excrete more than normal amounts of formimino glutamic acid in their urine. In one other patient such excessive excretion could be brought about by the administration of histidine.

As the folic acid co-factors concerned with glycerine and serine metabolism appeared to function normally in sprue patients, and as the factors concerned with histidine metabolism are essentially identical with those concerned with glycine and serine, it is thought that the urinary excretion of formimino glutamic acid by these patients is based on an abnormality of the enzyme process which converts formimino glutamic acid to glutamic acid.

H. Lehmann

HAEMATOLOGY

HUGHES, R. M. **Anaemia among Cocos Islanders: a Survey.** *Med. J. Australia.* 1959, Nov. 21, v. 2, No. 21, 763–5.

Home Island, in the Cocos atoll, was populated by Malayan workers in 1827, and has remained a self-contained community since. Malaria is absent, hookworm infection has not been detected, but *Ascaris* infection is heavy. The local diet contains fish, rice, flour, coconut oil, sugar, and fruits.

A survey of 442 subjects showed Hb levels rising from a mean of 7·06 gm./100 ml. at age 0–5, to 12·15 gm./100 ml. at age 31–35 for males, and to

10·88 gm./100 ml. for females of age 21–25. This is endemic anaemia of a very severe degree. All subjects whose Hb fell below 11·6 gm./100 ml. were given oral iron, and tested again 7 weeks later. As judged by mean Hb values there was a significant response, but it was of poor degree, the mean rising from 8·45 to 10·80 gm./100 ml. 212 subjects who had failed to respond were then given a second course of iron, and tested again 20 weeks later. There was no significant improvement.

The cause of this resistance to oral iron was not determined, it was not established that the anaemia was indeed sideropenic, and parenteral iron was unacceptable to the population; thus there is clearly a field for further investigation of this problem. *Alan B. Raper*

See also p. 627, MACDOUGALL, **The Haematological Picture in Kwashiorkor and Marasmus.**

See also p. 608, SAIF, **The Haemoglobin Level in Parasitic Disease.**

KAIPAINEN, W. J. & OHELA, K. **The Effect of Intrinsic Factor on the Schilling Test in Pernicious Tapeworm Anemia.** *Ann. Med. Intern. Fenniae.* Helsinki. 1959, v. 48, No. 4, 183–90. [18 refs.]

The authors have previously shown [Kaipainen and Ohela, this *Bulletin*, 1957, v. 54, 1333] that in the pernicious anaemia associated with tapeworm infection the excretion of radioactive vitamin B12 in the urine is increased, provided that intrinsic factor is administered at the same time. This effect became more marked after the expulsion of the tapeworm. In pernicious anaemia it has been demonstrated that absorption of vitamin B12 increases with increasing doses of intrinsic factor (*Brit. J. Haematol.*, 1955, v. 1, 46).

In order to find out whether vitamin B12 absorption rises in the pernicious anaemia of tapeworm with bigger doses of intrinsic factor, as it does in true pernicious anaemia, the following experiments were performed on patients with pernicious tapeworm anaemia. Urinary excretion of radioactive vitamin B12 was measured without intrinsic factor, together with large doses of intrinsic factor, and after expulsion of the worm. A significant effect of intrinsic factor on vitamin B12 absorption could be established. *H. Lehmann*

KOHLER, H. G., MEYNELL, M. J. & COOKE, W. T. **Spherocytic Anaemia, complicated by Megaloblastic Anaemia of Pregnancy.** *Brit. Med. J.* 1960, Mar. 12, 779–81.

GRIGGS, R. C., WEISMAN, R., Jr. & HARRIS, J. W. **Alterations in Osmotic and Mechanical Fragility related to *in vivo* Erythrocyte Aging and Splenic Sequestration in Hereditary Spherocytosis.** *J. Clin. Investigation.* 1960, Jan., v. 39, No. 1, 89–101, 9 figs. [22 refs.]

"Changes in erythrocyte osmotic and mechanical fragility associated with aging and splenic sequestration were studied in two patients with hereditary spherocytosis by the use of Fe^{59}. New red cells showed some increase in

fragility, but after approximately 10 days, conditioned cells with a marked increase in osmotic and mechanical fragility appeared in the peripheral circulation. At the time of splenectomy, red cells were recovered from the spleen, labeled with Cr^{51} and reinjected into the patient's peripheral circulation. The conditioned, most fragile cells disappeared rapidly, surviving less than two days; the other red cells, less osmotically and mechanically fragile, had a normal length of survival."

SONNET, J., VANDEPITTE, J. & HAUMONT, A. Anémie hémolytique par la nitrofurazone révélatrice d'une déficience globulaire en glucose-6-phosphate déshydrogénase. [**Haemolytic Anaemia from Nitrofurazone Revealing a Deficiency of Glucose-6-Phosphate Dehydrogenase in the Red Cells**] *Ann. Soc. Belge de Méd. Trop.* 1959, Oct. 31, v. 39, No. 5, 692–701, 3 figs. [19 refs.]

The haemolytic crisis occurred in an African in the Belgian Congo after 1·8 gm. of nitrofurazone had been given. His red cells were found to be deficient in glucose-6-P-dehydrogenase and this enzyme deficiency was also found in 20% of 300 adult male Africans in Léopoldville [see also this *Bulletin*, 1960, v. 57, 514].

HENDRICKSE, R. G., BOYO, A. E., FITZGERALD, P. A. & KUTI, S. R. **Studies on the Haemoglobin of Newborn Nigerians.** *Brit. Med. J.* 1960, Feb. 27, 611–14, 6 figs. [16 refs.]

Cord blood from 100 new-born children in Ibadan was examined, and a partial follow-up was achieved for the first 4 months of life. Sickling was detected in only 5 cord bloods, and in 6 cases it appeared for the first time during 2 months after birth. Hb C, however, because of its distinctively slow electrophoretic mobility, is more easily detected, and was found in one case at birth. The ability to demonstrate Hb S in sickling phenotypes at birth did not appear to depend upon the amount of Hb F present, inasmuch as the Hb F values for "delayed" sicklers ranged from 72 to 86% at birth, while for the "immediate" sicklers (5 children) the values were 50, 70, 89, 80, and 66·4%. It is not recorded whether the "immediate" sicklers with high Hb F subsequently proved to be homozygotes.

In an attempt to show whether foetal and adult haemoglobins occur in separate cells, or are mixed in the same cell, the authors give an elegant electrophoretic demonstration that differential osmotic lysis of an A + F + S blood can be resolved into fractions containing various amounts of these molecular species, a result which, as they say, offers direct support for the concept of separate cell populations. [This is as far as the abstracter can go with them; one of the effects of osmotic lysis is to distinguish cells of different ages, and the erythrocyte population at birth is a mixture of cells originating at very different foetal ages. The results obtained could equally well be explained if at various foetal ages different amounts of the three molecules were incorporated in the same cell.]

Another finding of great interest was that 11 of the 100 cord bloods contained a fast-moving Hb component. In a pair of identical twins this component persisted until the second month but had disappeared at the third. In one case the fast component resembled the "Bart's" haemoglobin, and in

2 other cases it corresponded with the original description of the variant of Fessas and Papaspyrou [this *Bulletin*, 1958, v. 55, 444]. An 11% incidence of an abnormal foetal haemoglobin is clearly of great interest.

Alan B. Raper

Bloch, M. & Gavidia, R. Hemoglobinas anormales. Estudio de una muestra de población Salvadoreña. [**Study of Abnormal Haemoglobins in a Section of the Population of El Salvador**] *Archivos Colegio Med. El Salvador.* 1958, June, v. 11, No. 2, 89–94, 3 figs. [19 refs.]

3 cases of haemoglobin S were found in 228 persons examined.

Katz, A. M. & Chernoff, A. I. **Structural Similarities between Hemoglobins A and F.** *Science.* 1959, Dec. 4, v. 130, 1574–6, 1 fig. [11 refs.]

"A striking similarity has been found between the composition of peptides obtained from tryptic digestion of normal adult hemoglobin (hemoglobin A) and fetal hemoglobin (hemoglobin F)."

Ingram, V. M. & Stretton, A. O. W. **Genetic Basis of the Thalassaemia Diseases.** *Nature.* 1959, Dec. 19, v. 184, 1903–9, 5 figs. [40 refs.]

The most important point in this discussion on the theories of thalassaemia is the proposal that in thalassaemia an abnormal haemoglobin may be present which cannot be discovered by electrophoresis. Haemoglobin is thought to consist of two pairs of polypeptide chains. In adult human haemoglobin two α and two β chains are found, and in foetal haemoglobin there are two α and two γ chains. Two abnormal haemoglobins, H and Bart's, are α-chain deficient, and their formulae can be written β_4 and γ_4 respectively. In all other instances variants of normal haemoglobin were shown to differ in one amino-acid, either in the α chain or in the β chain. This difference involved an alteration in charge and could, therefore, be discovered by electrophoretic examination. For example, a negatively charged glutamic acid in the β chain of normal adult haemoglobin was replaced in haemoglobin S by the neutral valyl residue, and in haemoglobin C by the positively charged lysyl residue. If an amino-acid is replaced by one of identical charge we would, at present, have no means of discovering it by electrophoresis and the present treatise suggests that, in thalassaemia, such alterations in amino-acid sequence could explain the abnormality. *H. Lehmann*

Levin, W. C. & Truax, W. E. **The Influence of Storage on Erythrocyte Survival in Blood obtained from Donors with Sickle Cell Trait.** *J. Lab. & Clin. Med.* 1960, Jan., v. 55, No. 1, 94–7, 3 figs. [14 refs.]

Blood from a sickle-cell trait donor was taken into "ACD" anticoagulant, and stored at 4°C. in the usual way. 30 ml. aliquots were removed at intervals, labelled with ^{51}Cr, and transfused to a compatible normal recipient. A parallel experiment was run with normal donor blood. Erythrocyte survival was followed in the recipients, and found to be equal for the sickling and the normal bloods, after storage of these for up to 20 days. Thereafter, the

sickling blood showed a survival curve which indicated the presence of 2 erythrocyte populations, a small proportion having a half-life of about 50% of that of the rest. Since this defect in cell viability only appears after 3 weeks, and only affects a small proportion of the sickling erythrocytes, it is concluded that the use of blood from sickle-cell trait donors involves no additional risk of haemolysis in the recipient under ordinary blood banking conditions. *Alan B. Raper*

JIM, R. T. S. & YARBRO, Marina T. **Hemoglobin J in a Healthy Hawaiian-Chinese-Caucasian Male.** *Blood.* 1960, Feb., v. 15, No. 2, 285–7, 3 figs.

"Hemoglobin J is reported in a 27-year-old healthy adult Hawaiian-Chinese-Caucasian male and 3 of his offspring. All were healthy and displayed no hematologic disturbances except for the youngest offspring, who exhibited mild nutritional iron deficiency anemia."

[See this *Bulletin*, 1959, v. 56, 89.]

VENOMS AND ANTIVENENES

DE VRIES, A., GITTER, S., KOCHWA, S., CONDREA, L., PERLMUTTER, C., LEVI, G., RECHNIC, J., MAOR, D., BRATU, A., CASPER, J., BORNSTEIN, D., DANON, D. & RIMON, A. [**Further Observations on Venoms of Snakes prevalent in Israel**] *Harefuah.* Jerusalem. 1960, Feb. 15, v. 58, No. 4 [in Hebrew 136–41. (39 refs.) English summary 142].

The English summary appended to the paper is as follows:—

"The venom of Vipera palestinae was fractionated by ion exchange chromatography and toxicological, biochemical and immunological properties of the fractions were studied. Evidence was obtained of the presence in the venom of a blood coagulation-accelerating factor in addition to anticoagulant. The recovery of neurotoxin by the chromatographic separation was higher than by the paper electrophoretic method used previously, and is indicative of an important role of the neurotoxin in the pathogenesis of the bite by the snake.

"Studies on the venom of Echis colorata and its chromatographic fractions were carried out in mice and in vitro. A hemorrhagin, a neurotoxin, anti-coagulant- and procoagulant activities, and various enzymatic activities are described. A specific antiserum was prepared in the rabbit. A partial cross immunity of Pasteur anti-Vipera palestinae serum with the Echis colorata venom was established. Anti-Vipera palestinae serum is recommended in case of Echis colorata bite until a specific antiserum will be available for therapeutic use in the human."

RUSSELL, F. E. **Rattlesnake Bites in Southern California.** *Amer. J. Med. Sci.* 1960, Jan., v. 239, No. 1, 1–10. [60 refs.]

This review describes the frequency of rattlesnake (*Crotalus* sp.) bite in Southern California, the properties of the venom and its clinical effects and finally sets out details of the current views on treatment.

Some 50 persons are reported to be so bitten in Southern California each year, with a resulting mortality of 1·5%.

9 species of *Crotalus* have been identified in this region and animal experimentation has demonstrated marked variation in the lethality of their venoms. In that of the commonest species, *Crotalus viridis helleri*, the approximate lethal dose for man would seem to be about 1·0 mgm. per kgm. body weight.

Snake venoms are complex substances whose chemical structure is not fully understood; they appear to be mixtures of various proteins which may exert predominantly neurotoxic, haemotoxic or cardiotoxic effects. The venom of a single species may exert any combination of the above effects. The clinical result of *Crotalus* bite varies widely with the species (and even with the location of that species), with the age and size of the snake, the number and depth of the fang punctures and the duration of the biting act. The size and age of the victim also influences the ultimate effect. *Crotalus* bites cause in the main local pain and swelling, haemorrhagic vesiculation, haemolytic anaemia and vasomotor collapse.

The author's advice on treatment merits close attention. He is a firm advocate of the "Three A's"—antivenene, antitoxin and antibiotic. He considers immediate local treatment to be important: this should comprise the application of a tourniquet where possible, local incision to lay open the tracks of the fang and the application of suction for 1 hour. At the end of this period the tourniquet is removed and cryotherapy instituted by the immersion of the bitten limb in an ice bath for 1 hour, after which ice-bags should be applied, with immobilization, for up to 3 days. [These measures are held to reduce local tissue necrosis, though cryotherapy does not appear to lower the case-mortality rate.]

The injection of antivenene constitutes the most important therapeutic measure, and it should be given from the earliest possible moment in adequate amounts. In the absence of allergy to horse serum, the contents of the first ampoule should be injected in 3 equal parts, by intramuscular injection, by local infiltration round the fang punctures or just proximal to the advancing oedema, and intravenously in a 5% glucose drip. Contents of subsequent ampoules should be given intravenously or intramuscularly to the dosage stated on the brochure enclosed with each.

Since snake-bite wounds may often be contaminated with tetanus and other clostridial spores, as well as by pyogenic bacteria, the appropriate antitoxins and an antibiotic should be administered as an essential precaution.

J. H. Walters

SARKAR, J. K. & LAHIRI, D. C. **Determination of Potency of Anti-Snake-Venom.** *J. Indian Med. Ass.* 1959, Nov. 1, v. 33, No. 9, 355–8.

GAJARDO-TOBAR, R. A proposito de escorpionismo. [**Scorpionism**] *Hosp. Viña del Mar.* 1959, Jan., v. 15, No. 1, 25–38, 2 figs. [19 refs.]

After a considerable introduction dealing with scorpions in general, their biology, habits and venom, their incidence in Central and South America and the symptoms produced by the venom in man, the author discusses fully 33 cases seen in Chile: 4 were from Valparaiso, 6 from Viña del Mar, and 23 from Casablanca, of which 18 were from rural areas. All but 3 of the affected persons were males, nearly half of them between 20 and 30 years old.

In 6 patients the lesion was trivial, in 10 there were only local manifestations, in 13 there were also mild general symptoms and only 4 cases were severe. 4 illustrative case histories are given. 15 of the lesions were on the hands. There were no deaths. Treatment was symptomatic. The scorpions could be identified in only 12 cases, namely 6 *Centruroides margaritatus*, 4 *Bothriurus borellianus* and 2 *Tityus forcipula*. *H. J. O'D. Burke-Gaffney*

WIENER, S. **The Production and Assay of Stone-Fish Antivenene.** *Med. J. Australia.* 1959, Nov. 14, v. 2, No. 20, 715–19, 2 figs. [14 refs.]

The venom of the stone-fish (*Synanceja trachynis*) [this *Bulletin*, 1959, v. 56, 1058] at *p*H 7 to 7·6 is toxic for a number of animals and was shown to be antigenic in the mouse, rabbit and horse, and the serum from suitably immunized animals contained neutralizing and precipitating antibodies. A therapeutic antivenene was prepared by injecting a horse subcutaneously at weekly intervals with increasing doses of stone-fish venom adsorbed on aluminium phosphate. The antivenene was assayed in mice by the intravenous route, on a death or survival basis, and also in rabbits by the intradermal route, the dose of antivenene that neutralized the ischaemic skin reaction being measured. Concentration and refinement of the raw horse serum increased the neutralization titre about 16-fold. The two methods of assay did not give results that were in close agreement, but it was considered that they were within the limits of the experimental error expected in this type of assay (mouse test, 1 ml. serum neutralized 16 mgm. venom; rabbit test, 1 ml. serum neutralized 20 mgm. venom).

Although the animal experiments showed that the antivenene could neutralize all the observable toxic effects of the stone-fish venom there seems to be some question about its use as a therapeutic agent in man. Emetine hydrochloride solution infiltrated into the site of stone-fish stings usually gives very good results [*ibid.*, 1959, v. 56, 1185] and does not carry the disadvantages attached to injections of serum. It is suggested that the use of antivenene should be reserved for cases that do not respond to emetine or permanganate treatment. *H. J. Bensted*

TOXOPLASMOSIS

PROC. ROY. SOC. MED. 1960, Feb., v. 53, No. 2, 108–16 (Sect. Epidem. & Preventive Med. 2–10). [Numerous refs.] **Discussion on Toxoplasmosis** [BEATTIE, C. P.; BEVERLEY, J. K. A.; LUDLAM, G. B.].

In this symposium from Sheffield and Leeds, Beattie introduces the subject in dealing with the epidemiology of toxoplasmosis. The incidence and spread of the disease and its serological manifestations are briefly discussed, and a clear distinction is drawn between the effects of the proliferative and the encysted forms of the parasite.

Beverley deals with congenital toxoplasmosis in its various guises and considers the clinical problem of what to do about the pregnant woman with antibodies to toxoplasms.

Ludlam describes the laboratory diagnosis of toxoplasmosis, from isolation of the organism through gland biopsy to serology and the vexed question of the interpretation of serological findings. *I. A. B. Cathie*

Cook, I. & Pope, J. H., with the technical assistance of W. Scott. *Toxoplasma* **in Queensland. III. A Preliminary Survey of Animal Hosts.** *Australian J. Exper. Biol. & Med. Sci.* 1959, June, v. 37, Pt. 3, 253–61. [15 refs.]

The authors describe the results of complement-fixation tests carried out in Queensland with the sera from 497 wild mammals, belonging to 17 species (bandicoots, opossums, kangaroos, various rats and bats) and 428 domestic mammals (cats, dogs, horses, goats, sheep, cattle, pigs), with the object of discovering among them reservoirs of toxoplasmosis.

Positive reactions to high titres were obtained with the sera of bandicoots (*Thylacis obesulus* and *Perameles nasuta*), a brush-tail opossum (*Trichosurus vulpecula*), and rats (*Rattus rattus*, *R. norvegicus*, *R. assimilis*, *R. conatus*, *Hydromys chrysogaster*, *Melomys* sp.), while 2 dogs, one horse and a cow reacted to low titres. The parasites were isolated from 16 animals (bandicoots, opossums, marsupial rats, rodent rats, cat and crow), but these strains were of low virulence for mice. Further infections occurred in captive bandicoots.

From a comparison of the incidence of toxoplasmosis in animals, the authors conclude that wild animals—and particularly bandicoots [see also this *Bulletin*, 1958, v. 55, 692]—are important reservoirs of the disease in Queensland, while domestic mammals play a subsidiary role as sources of the infection. There is also little serological evidence of infection in animals whose meat is consumed by man [*ibid.*, 1959, v. 56, 563]. *C. A. Hoare*

Dasgupta, B. & Kulasiri, C. **Some Cytochemical Observations on** *Toxoplasma gondii*. *Parasitology*. 1959, Nov., v. 49, Nos. 3/4, 594–600. [17 refs.]

"A positive Feulgen reaction has been seen in all stages of *Toxoplasma gondii*. The intense basophilia seen in the intracellular and the extracellular stages is removable by treatment with ribonuclease. Granules which reacted positively with the periodic acid-Schiff technique were found in abundance in the cytoplasm of the cysts, whereas the same granules were not universally present in the intracellular and the extracellular stages at all days of infection. The cyst wall stained with this technique with varying degrees of intensity.

"It is thought that the variations seen in the individual parasites may be attributed to various causes, for example, strain differences, differences in the reaction of the host to the parasite, differences in the period of infection or to other unknown causes."

Ludvík, J. Die Silberfibrillenstruktur bei *Toxoplasma gondii* und *Sarcocystis tenella*. [**The Silver-Fibrillar Structure in** *Toxoplasma gondii* **and** *Sarcocystis tenella*] *Ztschr. f. Parasitenk.* 1959, v. 19, No. 4, 311–14, 2 figs.

A description is given of the silver-line system in *Toxoplasma* and *Sarcocystis*. Material of the former was obtained from the peritoneal exudate of infected mice, that of the latter was represented by spores isolated from the

oesophagus of sheep. The parasites were stained by Klein's silver impregnation method. In both the staining revealed a dark spot at the anterior pole, in the conoid, while at a short distance below there was a ring from which fibrils, running in left spirals to the posterior end, arose. These numbered 6 in *Toxoplasma* and 12 in *Sarcocystis*. Starting from the middle third of the body, the longitudinal fibrils were connected by transverse anastomoses (in the form of complete rings in *Toxoplasma*, and of incomplete ones in *Sarcocystis*) the whole forming a fibrillar network, the appearance of which is illustrated in a series of photomicrographs.

It is thought that the fibrils function as neurofibrils and myonemes, playing a part in the locomotion of these organisms, which is effected mainly by movements of the anterior portion of their body. The similarity of the fibrillar system in both parasites is regarded as evidence of their systematic affinity.

C. A. Hoare

Remington, J. S., Jacobs, L. & Kaufman, H. E. **Toxoplasmosis in the Adult.** *New England J. of Med.* 1960, Jan. 28 & Feb. 4, v. 262, Nos. 4 & 5, 180–86; 237–41, 10 figs. [102 refs.]

A general review.

Varela, G., Roch, E. & Torroella, J. Estudio de toxoplasmosis ocular. [**Study of Ocular Toxoplasmosis**] *Salud Pública México.* 1959, Oct.–Dec., v. 1, No. 2, 177–8.

The authors, in Mexico, inoculated 3, 33, 5 and 8 rabbits respectively *via* the conjunctiva, anterior chamber, vitreous and retrobulbar region with a local strain of *Toxoplasma gondii*. The results are tabulated and indicate the various changes seen in the eyes. In the animals inoculated in the anterior chamber, *T. gondii* was found at autopsy once in the lung, liver and eye and once in the lung only. The organism was also found in the 3 organs named in an animal inoculated in the vitreous and in the lung of one which had retrobulbar inoculations. [No figures are given for these findings in the table and it is assumed that they are single isolations.]

Smears from the eyes of 223 pigs in an abattoir, which had choroid lesions, were shown to harbour *T. gondii* in 87 cases.

In 43 persons with chorioretinitis and 24 with iritis the dye test was positive at a titre of 1/64 or more in 23 and 13 respectively.

H. J. O'D. Burke-Gaffney

Przerwa-Tetmajer, A. Rola toksoplazmozy w patologii ciąży. [**The Role of Toxoplasmosis in the Pathology of Pregnancy**] *Archiwum Immunol. i Terapii Dośw.* Warsaw. 1959, v. 7, No. 2, 303–46. [138 refs.] English summary.

An investigation has been made of the effect of infection with *Toxoplasma gondii* upon the course of pregnancy in guineapigs and rats which were mated after surviving the acute stage of the infection. Abortions, stillbirths and

neonatal deaths were frequently observed, and the organisms could be isolated in many cases from the brains of the animals and their surviving progeny.

D. J. Bauer

PALENCIA, L., TORROELLA, J. & VARELA, G. Ensayos terapéuticos en la toxoplasmosis experimental. [**Therapeutic Trials in Experimental Toxoplasmosis**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1959, Mar., v. 19, No. 1, 7–10.

The English summary appended to the paper is as follows:—

"A series of therapeutic trials with 17 different drugs against toxoplasmosis is presented. Sixteen of the drugs tried were useless. Lederkin (3-sulphanilamide-methoxypyridazine) was able to protect mice against infection with the Mexican strain of *Toxoplasma gondii*."

DERMATOLOGY AND FUNGUS DISEASES

GELFAND, M. **Melanosis—a Peculiar and Rare Dermatosis seen in the African of Mashonaland.** *Central African J. of Med.* 1959, Nov., v. 5, No. 11, 595–8, 5 figs.

The eruption consists in a variable number of permanent pigmented patches. They may occur anywhere on the skin but are best seen on the trunk where they form well demarcated patches of inconstant size but usually about 2 cm. in diameter. They are sometimes associated with a transient red papular rash elsewhere on the body and with attacks of abdominal pain, accompanied by vomiting. The prognosis as to life, however, appears excellent.

3 cases are described: 2 males aged about 28 and 50 and 1 female aged about 26. All functional investigations were negative, histological examination inconclusive and the urine free of porphyrins.

In differential diagnosis both porphyria and pellagra may be excluded and although the rash seen on the older male patient resembled that sometimes seen after taking phenolphthalein, the only medicine taken by this patient was aspirin.

The paper is illustrated by 5 photographs. *H. T. H. Wilson*

FURTADO, T. A. & BATISTA, G. Tratamento do pênfigo foliáceo pelo triamcinolona. Novas observações pessoais. [**Treatment of Pemphigus foliaceus with Triamcinolone**] *Hospital.* Rio de Janeiro. 1959, Oct., v. 56, No. 4, 657–64, 6 figs.

The English summary appended to the paper is as follows:—

"The authors report their further observations in the treatment of ten patients with pemphigus foliaceus by Triamcinolone. Substantiating their preliminary work they observed total involution of the skin manifestations in

all cases. The period of treatment lasted from 34 to 166 days, the initial dose was 32 mg, the maximum average daily dose 22 mg and the maintenance dose 4 to 8 mg. The undesirable side effects of steroid therapy were minimal or non existing. These results allow a conclusion that Triamcinolone is the corticosteroid of choice in the treatment of pemphigus foliaceus."

[See this *Bulletin*, 1959, v. 56, 564.]

BAUM, G. L. & SCHWARZ, J. **North American Blastomycosis.** *Amer. J. Med. Sci.* 1959, Dec., v. 238, No. 6, 661–83, 8 figs. [148 refs.]

This paper discusses the pathogenesis, clinical picture and treatment of North American blastomycosis in the light of the recent literature and the experience of the authors.

The disease is almost restricted to the North American continent; reports of cases from Europe and elsewhere are often poorly documented and therefore suspect though 2 authentic cases from South America have been described [this *Bulletin*, 1955, v. 52, 687, 1019].

The authors believe emphatically that blastomycosis of the lungs is the primary form of the disease and all other lesions are due to metastatic spread from the lung focus. Skin lesions are common and may take the form of spreading ulcers or subcutaneous abscesses which break down. Involvement of the genito-urinary tract is frequent in men and destructive, punched-out bone lesions have been reported. A not uncommon site of involvement is the larynx. Chest X-ray examinations may reveal almost any type of pulmonary involvement though pleural effusions are distinctly uncommon. It is emphasized that generalized spread of the disease is dependent on the activity of the lung focus. If this is quiescent or healed, the only danger is from local extension of a peripheral lesion and local excision will lead to cure of the condition. If the lung focus is active, further dissemination may occur and drug treatment must be used.

The only drugs which have proved of value in the treatment of the disease are the aromatic diamidines, stilbamidine and 2-hydroxystilbamidine, and the antibiotic amphotericin B. It is likely that this antibiotic will be the most effective.

The diagnosis depends much on the awareness of the physician, though skin tests and serological reactions, which may be equivocal, can often be valuable when they are positive and the possibility of cross reaction with other fungal species has been eliminated. *Peter Abbott*

GORDON, C. A. & STEWART, W. B. **Treatment of North American Blastomycosis with Amphotericin B.** *Canadian Med. Ass. J.* 1960, Feb. 27, v. 82, No. 9, 471–3, 4 figs. [10 refs.]

"The first case of systemic North American blastomycosis to be recognized in Nova Scotia has been reported. A satisfactory recovery followed use of amphotericin B; agranulocytosis developed during treatment."

[See this *Bulletin*, 1958, v. 55, 322.]

Beard, H. W., Richert, J. H. & Taylor, R. R. **The Treatment of Deep Mycotic Infections with Amphotericin B. With Particular Emphasis on Drug Toxicity.** *Amer. Rev. Respiratory Dis.* 1960, Jan., v. 81, No. 1, 43–51, 5 figs. [20 refs.]

7 patients with chronic pulmonary coccidioidomycosis, one with disseminated blastomycosis and one with chronic pulmonary histoplasmosis were treated with amphotericin B. The drug, given daily in 6-hour intravenous infusions in a dosage of approximately 1 mgm. per kgm. of body weight for 4 to 6 weeks, produced definite clinical improvement in 4 cases of coccidioidomycosis and in the one case of blastomycosis.

Acute toxic reactions of varying severity frequently occurred during the intravenous infusions, particularly during the first week of treatment, and were usually abrupt in onset with nausea and vomiting. For severe reactions the infusions were stopped but in milder cases a slowing of the rate of administration was sufficient. Mild to moderate pain at the site of the infusion was usual and the veins became progressively more difficult to infuse.

A definite suppressive effect on the normal renal function resulted during the administration of amphotericin B and the blood urea rose. This was temporary and normal function returned after the completion of therapy.

It is concluded that the indications for treatment with this drug must be definite before a course is started, for the difficulties of administration and the distressing side effects are many. *Peter Abbott*

González Ochoa, A. & González Mendoza, A. Micosis en Mexico. [**The Mycoses in Mexico**] *Salud Pública México.* 1959, Oct.–Dec., v. 1, No. 2, 103–15, 1 map. [88 refs.]

Lisbóa Miranda, J. & Machado, J., Jr. Considerações relativas à blastomicose sul-americana. Análise do diagnóstico micológico em 261 casos consecutivos. [**South American Blastomycosis**] *Hospital.* Rio de Janeiro. 1959, Oct., v. 56, No. 4, 579–93, 6 figs. English summary.

Study of the mycological diagnosis in 261 consecutive cases.

Mackinnon, J. E. **Pathogenesis of South American Blastomycosis.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1959, Nov., v. 53, No. 6, 487–94, 5 figs. (4 on 2 pls.) [27 refs.]

The frequent association of oropharyngeal lesions with infection by *Paracoccidioides* (*Blastomyces*) *brasiliensis* has given rise to the belief that the oral mucosa might be the portal of entry for this pathogen. In order to test this belief the author induced a number of experimental infections in mice with cultures of *P. brasiliensis* by various routes, *viz.* bronchopulmonary, intravenous, peritoneal, and intramuscular. Attempts to induce infection by subcutaneous and intestinal routes were unsuccessful.

Infection by the bronchopulmonary route, which was induced without difficulty, resulted in pulmonary lesions which, on microscopical examination

revealed "a granulomatous reaction with histiocytes, macrophages, giant cells and a very moderate fibrous reaction". In some of the mice haematogenous dissemination took place involving other viscera such as the spleen, liver, adrenals, and in some cases, the brain.

Widespread dissemination of the disease resulted from inoculation by the intravenous route, the lungs, lymph glands, intestinal tract, spleen, myocardium, skeletal muscles and muscles of the tongue, all becoming affected. In some animals there were lesions also in the lips and other parts of the oropharynx.

Local lesions were produced by direct inoculation of the muscles of the tongue and legs.

The author concludes from the results of these experiments that oropharyngeal lesions are probably metastatic in origin. *C. J. La Touche*

Lacaz, C. S., Passos, M. C. R., Jr., Fava Netto, Celeste & Macarron, B. Contribuição para o estudo da "blastomicose-infecção". Inquérito com a paracoccidioidina. Estudo sorológico e clínico-radiológico dos paracoccidiodino-positivos. [**Use of Paracoccidioidin in the Investigation of Blastomycosis Infections**] *Rev. Inst. Med. Trop. São Paulo.* 1959, Nov.–Dec., v. 1, No. 4. 245–59, 6 figs. [23 refs.] English summary.

Intradermal injections of 0·1 cc. of a filtrate of a culture of *Paracoccidioides brasiliensis* diluted 1 in 10 and 1 in 100 were tested on 529 persons aged from under 1 year to over 50, a papule of 5 mm. or more in diameter being taken as positive when read after 48 hours.

7 persons were positive at 1 in 10 and 18 were positive to both dilutions, and complement-fixation and precipitin tests as well as chest X-ray examinations were performed on these 25 patients. The highest percentage of positives was in the 30–50 year age-group. Of the 25 persons positive 5 gave positive complement-fixation and 6 a positive precipitin test. 9 had some non-specific abnormality in the chest X-ray picture, but 1 of these 9 had an isolated nodule with a positive complement-fixation test.

The authors consider that by itself the paracoccidioidin intradermal test is of very little value and cross reactions occur with histoplasmin. In positive cases there should be periodic examination of the person with the administration of drugs suitable for the treatment of blastomycosis to see whether the suspected lesions regress. They are sure that "sub-clinical" infections can occur. *W. K. Dunscombe*

TROPICAL OPHTHALMOLOGY

Bernkopf, H. **The Susceptibility of White Mice to a Strain of Trachoma Virus and their Use in Neutralization Tests.** *Bull. Res. Counc. of Israel.* 1959, Oct., v. 8E, Nos. 1/2, 25–9.

In an attempt to find a suitable host system for the detection and titration of neutralizing antibody for trachoma virus, the infectivity of this agent for a number of tissue culture systems and for suckling and adult animals of a

number of species has been investigated. Two strains of virus were used: an Israeli strain Dari and the Chinese Tang strain [this *Bulletin*, 1958, v. 55, 96]. Cultures of human amnion, HeLa, KB, monkey kidney cells and chick fibroblasts proved insusceptible.

Sucklings and adults of the following species—Swiss mice, C57 and R3 mice, spiny mice, voles, hamsters, white rats and guineapigs—were inoculated by the cerebral, peritoneal or nasal routes. None proved susceptible to the Dari strain whereas the Tang strain was highly pathogenic for both adult and suckling mice by the cerebral route; suckling mice were further shown to be susceptible when injected intranasally and intraperitoneally.

Antisera were prepared in rabbits and 6-week-old mice by a series of 4 injections of virus grown in yolk sac given intravenously in the rabbits and intraperitoneally in the mice. Pools of sera from patients with acute and chronic trachoma were also collected. A mouse-brain passage strain of Tang was used for neutralization tests after contact with the serum dilutions for 4 hours at room temperature and overnight at 4°C., by intranasal inoculation of 9–10-day-old mice. Sera from trachoma patients, acute and chronic, from healthy people and normal mice were without effect. The anti-Dari and anti-Tang sera made in the rabbits and the anti-Tang serum made in mice possessed significant neutralizing power. *S. P. Bedson*

REINHARDS, J., WEBER, A. & MAXWELL-LYONS, F. **Collective Antibiotic Treatment of Trachoma. Report on Comparative Trials leading to More Economic Methods of Treatment.** *Bull. World Health Organization.* Geneva. 1959, v. 21, No. 6, 665–702, 3 figs.

"By the early 1950's it was clear from numerous independent reports that certain of the broad-spectrum antibiotics were effective against the agent of trachoma. It seemed, however, that treatment had to be continued over long periods to effect a cure of the average case. With the assistance of WHO, comparative trials on a scale hitherto unprecedented in the disease—involving more than 9,000 schoolchildren with active trachoma—have been conducted in Morocco since 1953 in order to assess the value of local treatment of trachoma with chlortetracycline and to develop simple and economic methods of treatment, for which there was a pressing need. Local application of 1% chlortetracycline ointment two or three times daily for 60 days gave almost 80% cures under reasonably favourable conditions and nearly 100% cures after retreatment of cases not cured by the first course. Equally good results followed intermittent short-term treatment over longer periods. Relapse and reinfection rates were low.

"Collective mass treatment with antibiotics is clearly a valuable method of trachoma control. The use of intermittent treatment allows for a great economy both in antibiotics and in staff and other campaign expenses and makes possible the wide expansion of mass treatment programmes."

See also p. 637, VARELA *et al.*, Estudio de toxoplasmosis ocular. **[Study of Ocular Toxoplasmosis]**

TROPICAL ENVIRONMENTAL CONDITIONS

LEMAIRE, R., BOURA, M. & DUPONT, M. Mécanisme de l'hypotension orthostatique tropicale. [**Mechanism of Orthostatic Hypotension in the Tropics**] *Bull. et Mém. École Nat. Méd. Pharm. de Dakar.* 1958, v. 6, 134–9, 3 figs. [18 refs.]

The normal response to sudden tilting from horizontal to vertical position is an increase in blood pressure and pulse rate due to the carotid sinus reflex. In a heated chamber there is inversion of these effects of tilting. This inversion has also been observed by the present authors in 13 subjects transferred to French West Africa, of whom only 1 responded to tilting by increased pressure.

The authors do not believe this is due to a change in cardiac response or to reduction of the hypertensive effects of adrenaline release although this mechanism is known to be reduced or absent in animals exposed to heat. Nor is this effect due to dehydration with haemoconcentration since the authors' measurements have shown no significant change in plasma or extracellular fluid volume in these subjects.

The authors believe that the effect is due to inability of vasoconstriction to overcome the pooling of blood drawn by gravity into the vessels of the lower limbs which are maximally dilated by exposure to heat. *M. L. Thomson*

CHANDRA, S. & TANDON, O. P. **Heat Stroke: a Clinical and Biochemical Study.** *J. Ass. Physicians India.* 1959, May, v. 7, No. 3, 273–7, 2 figs. [13 refs.]

There were several unusual features in this account of 28 cases of heat stroke which occurred in Lucknow, India, in May–June 1958. For example, 15 admissions to hospital were in the last week of a heat wave. This had lasted for 1 month with maximum temperatures exceeding 107°F. every day and hotter weather had occurred earlier in the month.

5 patients were under 20 years old, and 8 under 30. 23 were male and nearly all were labourers.

Haemoglobin, serum sodium and potassium and blood urea were all within normal limits so that dehydration appeared to be absent.

12 patients (43%) died, and in these the time elapsing between onset and admission to hospital was 18 hours on the average, compared with 7 hours in those who recovered.

[Humidity is not reported in this paper. The rains came in late June and the heat stress then may well have exceeded that of the earlier weeks when dry bulb temperature was higher. The authors' claim therefore requires substantiation, that these cases were related more to the duration than to the height of temperature.] *M. L. Thomson*

MISCELLANEOUS DISEASES

HENNEAUX, J. A propos d'un cas de thrombo-phlébite cérébrale chez le Noir. [**A Case of Cerebral Thrombophlebitis in an African**] *Ann. Soc. Belge de Méd. Trop.* 1959, Oct. 31, v. 39, No. 5, 643–52, 1 fig. on pl.

CARTER, F. S. **Peptic Ulcer in Africans.** [*Correspondence.*] *Brit. Med. J.* 1960, Feb. 13, 505–6.

This correspondent, writing from Aden, refers to recent observations on peptic ulcer in Africans, the apparent variability in incidence and the difficulties in assessing it, especially in relation to different socio-economic groups [this *Bulletin*, 1960, v. 57, 182].

He was himself stationed in Freetown, Sierra Leone, between November 1955 and August 1959 and during that time 86 Africans were referred to him for barium studies. The findings are tabulated. Almost all the patients came from Freetown or its environs (population *circa* 100,000). Of 33 with proved or suspected duodenal ulcers 13 were educated and held responsible appointments or were students working for academic qualifications. The author has reason to consider that this figure gives a reasonably accurate indication of the incidence of peptic ulcer in the more highly educated, well-to-do Africans in Freetown, whom he estimates to number some 500 to 1,000.

The other 20 patients in this diagnostic group and all 8 with gastric ulcers and 6 with gastric carcinoma were from the lower socio-economic groups.

As Doctor Carter was the only person in Sierra Leone at that time in a position to provide barium studies he supposes that if peptic ulcer was common in the Protectorate more patients would have been referred to him than the number actually seen.

He believes, with others, that duodenal ulcer is much less frequent in the general population than in those holding responsible posts; he adds that several patients in the latter group volunteered the information that periods of overwork and mental strain had exacerbated their symptoms, so that stress was clearly a factor.

He suggests that the incidence of peptic ulcer may well rise as Africans take over administration and managerial burdens and responsibilities, while it will remain comparatively rare in the "non-civilized areas where the African continues to live his happy-go-lucky, day-to-day existence, letting tomorrow take care for itself". *H. J. O'D. Burke-Gaffney*

GOVIL, K. K., GUPTA, B. M., KAPUR, S. D., CHAKRAVARTY, N. C., BHATNAGAR, D. P. & PANT, K. C. **Field Investigations of Lathyrism in Uttar Pradesh.** *J. Indian Med. Ass.* 1959, Dec. 16, v. 33, No. 12, 499–506. [31 refs.]

Lathyrism has a long history in India and a considerable medical literature, which is clearly and concisely reviewed here. That it is still an important problem is shown by the fact that the authors found 563 patients in 4 districts. These were all poor, mostly landless, labourers whose diets consisted largely of *bejhar*, a mixture of wheat, grain and *Lathyrus sativus*, which might contain from 25 to 90% of the last. The diets provided very little

animal protein, vitamin A or vitamin C and the consumption of "protective foods" was negligible. Most of the patients were in the age-group 11–20 (36·2%) or 21–30 (32%) and 93% of them were males. The onset was almost always sudden and once the full disability had developed, there was little or no clinical improvement. In these respects this report differs in no way from the classical description of the disease given by SLEEMAN in 1844. Biochemical studies showed that the alkaline phosphatase, inorganic phosphate and calcium levels in the serum were within normal limits. A high proportion of the patients gave a positive Wassermann reaction, but so did unaffected controls in the same district. Contrary to a previous report, the cereals consumed contained a low manganese content, samples varying from 1·0 to 3·7 mgm. Mn per 100 gm.

The authors thus leave their problem exactly where they found it. However, they draw attention to the fact that lathyrism remains an important epidemic disease in man and that no substantial increase in our understanding of the disease has been made in the last 100 years. This paper thus presents a clear challenge to modern scientific medicine.

The paper ends with the wise recommendation that reorientation of agricultural practice and health education of the people are the main remedial measures, along with the improvement of the economic condition of the area. The State Government is already taking action along these lines.

R. Passmore

BASU MALLIK, K. C. & BHATTACHARYA, D. K. **The Role of Histamine in Tropical Eosinophilia.** *J. Indian Med. Ass.* 1959, Oct. 1, v. 33, No. 7, 260–63. [34 refs.]

In 20 patients experiencing the acute phase of tropical eosinophilia, an increased histamine content of the whole blood was found in 11 cases, the rise being confined to the cellular components, and corresponding significantly with the absolute eosinophil count. Histamine in the sputum (normally absent) was detectable in small amounts in all patients.

After the relief of symptoms by Acetylarsan or diethylcarbamazine, 10 patients were available for re-examination, and now only 2 of these showed a blood histamine outside the normal range, and the correlation between blood histamine and eosinophil count had vanished. Some special relation between these two parameters therefore seemed to be present during the acute phase of tropical eosinophilia. The coincident appearance of eosinophils and histamine in the sputum suggested that a function of the former was to remove endogenously produced histamine. But whether histamine release was the cause of the pulmonary symptoms remained undetermined, especially as these symptoms were not ameliorated by antihistamine drugs.

Alan B. Raper

FRANCO, R., BORIES, S. & COUZIN, B. A propos de 142 cas de méningite à éosinophiles observés à Tahiti et en Nouvelle-Calédonie. [**142 Cases of Eosinophilic Meningitis seen in Tahiti and New Caledonia**] *Méd. Trop.* Marseilles. 1960, Jan.–Feb., v. 20, No. 1, 41–55. [34 refs.]

Spinal eosinophilia is not infrequent in neuromeningeal forms of cysticercosis, but is rare in other parasitic infections. During the last few years,

at first in New Caledonia and then in Tahiti, a number of important meningitic syndromes with moderate hypercytosis and with intense eosinophilia (above 50%) in the cerebrospinal fluid were encountered. Of these 11 cases were in New Caledonians and 131 in Tahitians; in the last in slightly epidemic form. The meningitic syndrome of moderate intensity was most frequently encountered.

Meningitic symptoms commonly consist of cephalalgia and post cervical pain without Kernig's sign. The cerebrospinal fluid shows a definite pleocytosis and a very high eosinophilia, in some cases quoted 82%, gradually diminishing over a period of time (one month or longer). The intensity of the meningism is often notable and the syndrome may take from 1 to 4 months to develop. Spontaneous cure is usual, but in 5 cases relapses and recrudescences have been recorded.

In the course of evolution of the syndrome certain transitory paralytic phenomena have been recorded. Once it was the facial nerve and in 2 others the oculomotor. In 1 patient the arm and shoulder-girdle were affected. In some otherwise healthy Tahitians a transient facial paralysis appeared. Mild and masked forms are frequently encountered, but in general there is just moderate headache which does not interfere with the activities of the patient: meningism may then be heralded by characteristic manifestations, but there is little pyrexia.

There are also inapparent forms.

The cerebrospinal fluid is cloudy, opalescent or clear according to the cellular density. The density is very variable. Often there are 500–1,000 cells per cmm. The albumin content is generally less marked—0·4 gm. to 0·6 gm. per 1,000. This factor is dissociated from the cytology. The parasitological and bacteriological examinations in this series were constantly negative. The blood picture usually shows 15–20% eosinophils on an average for 10,000 leucocytes per cmm.

As regards the epidemiological aspects: in Nouméa 11 cases were observed during the years 1951, 1952 and 1953. 4 were seen in 1952 and 5 in 1953. In 1958, 61 cases, and in 1959, 69 cases were seen in Tahiti. In 1958 the disease occurred in Papeete, but appeared in the rural districts, and in Taravao in 1959. Adults from 18 to 45 years old are most frequently affected. Only 7 cases were seen in children. There is no disproportion between the sexes. All attempts at establishing the true aetiology have failed.

Wuchereria bancrofti, cysticercosis, trichuriasis, *Ascaris*, *Ancylostoma*. *Strongyloides stercoralis*, *Trichinella*, *Setaria digitata*, *Taenia taeniaeformis*, have all been considered but no evidence for a role played by them has been found.

11 illustrative cases are described. *Philip Manson-Bahr*

PROVOST, A. & VIGIER, M. Isolement au Tchad (Afrique Centrale) de deux souches de *Malleomyces pseudomallei*. [**Isolation in the Tchad Region (Central Africa) of Two Strains of** *Malleomyces pseudomallei*] *Ann. Inst. Pasteur*. 1960, Mar., v. 98, No. 3, 461–3.

The English summary appended to the paper is as follows:—

"One of these strains has been isolated from a goat of the Tchad region, the other one from a soldier who had lived in Indochina five years before. The

authors discuss the question of the disease in Central Africa: has it been present in the country for a long time, or has it been recently introduced?"

[See this *Bulletin*, 1944, v. 41, 694.]

SAHAY, L. K. **Rhinosporidiosis.** *J. Indian Med. Ass.* 1960, Jan. 16, v. 34, No. 2, 59–61, 64, 2 figs. on pl. [19 refs.]

A case in Bihar.

MURNAGHAN, M. F. **Site and Mechanism of Tick Paralysis.** *Science.* 1960, Feb. 12, v. 131, 418–19, 1 fig. [14 refs.]

"A neurophysiological investigation indicates that the paralysis produced in the dog by the wood tick, *Dermacentor andersoni* Stiles, is due to failure in the liberation of acetylcholine at the neuromuscular junction because of a conduction block in the somatic motor fibers produced by the tick 'toxin'."

PARRY, H. B. **Scrapie: a Transmissible Hereditary Disease of Sheep.** *Nature.* 1960, Feb. 13, v. 185, 441–3.

There has long been difficulty in the interpretation of the flock incidence of scrapie which is a disorder apparently confined to sheep, almost invariably fatal, and having distinctive clinical features. The onset is insidious with weakness which is followed by wasting and in variable degree wide "ataxic" stance. The first symptoms occur after sexual maturity, and in a commercial flock, therefore, after offspring have been sired or conceived. The animals subsequently affected have often made exceptionally rapid progress towards a skeletal musculature and body configuration deemed highly desirable in certain breeds. Many winners of prizes have subsequently developed the disorder.

The absence of regular transmission indicating dominant inheritance and the irregular age of onset, together with very varying incidence in different flocks, has determined an epidemiological pattern which has most often been interpreted as being the result of infective agents. This conclusion was strengthened by the evidence that lambs and kids inoculated intravenously with brain suspensions from infected animals have been shown by Parry and others rather constantly to develop a disease very similar to scrapie within 2 years.

The long and patient work of Dr. Parry now reported is of great interest and it suggests that susceptibility is determined genetically by a simple recessive mechanism. Over a period of 7 years he has studied 70 flocks of 10 different breeds, with about 10,000 breeding ewes. He has data on 800 cases, the majority being in ewes, only 40 being in rams. Most of the flocks are "closed" except for the introduction of new rams which may run with a flock for one or two seasons. Experimental mingling of affected animals with a scrapie-free flock has not resulted in any cases of scrapie in the free flock over periods of 3–5 years. There are known instances of introduction to a scrapie-free flock of rams which afterwards became affected, where after intervals of 1½–2½ years scrapie did not appear in the flock.

The author suspected the significance of the transmission by rams but the pattern was very irregular until he took into consideration the varying ages of onset in the sexes and the variables which could result, on a single recessive gene hypothesis, from rams being heterozygote carriers or homozygotes who subsequently were affected.

By considering the ages of onset by sex he derives a " manifestation factor " which gives an estimate of the proportion of all homozygotes who would be expected to be affected by a given age. On a single recessive hypothesis the genotypes of the various partners to matings can be deduced from whether they were or were not subsequently affected, and from whether or not they subsequently had affected offspring. With the aid of these and other logical deductions from his data a series of matings was assembled where the genotypes, on hypothesis, were reasonably firm. By considering the age distribution of the offspring when last observed and applying an exposure risk or " manifestation factor " to the expected Mendelian ratios, an " expected " number and proportion of offspring for each type of mating can be estimated. The actual numbers and proportions of affected can then be compared.

The agreement of observation and expectation is impressively close and taken together with the general pattern and natural history of the disorder in individual sheep and in flocks seems as good evidence as can be expected in support of the hypothesis that the trait is inherited by a single recessive gene mechanism.

In view of the late onset of the trait and some man-devised positive selection, it is not surprising that the frequency of the trait has risen to a level which in some flocks has disastrous economic consequences. It should be possible to confirm the recessive hypothesis conclusively by breeding experiments although this would take time and would be costly. Ability to detect in the ram the homozygote before onset and the heterozygous carrier would, however, permit complete control.

The author suggests as an explanation of the experimental transmission of the disorder by cerebral inoculation that in the homozygous individual a substance is formed which determines the degenerative changes and that this substance can be transmitted with brain tissue, and is in some way self-replicatory. The substance is stable to heat and does not determine any of the immune responses of a type associated with viruses.

[This paper is itself a condensation of more detailed reports to be published and should be read in the original by those interested. It is of particular interest to human geneticists. As in man, deductions have had to be made from observed patterns of distribution of the trait in " families ". Further, as in a number of human conditions of inherited susceptibility such as rheumatic fever some method has to be devised to cope with the difficulties of interpretation determined by late age of onset. It is also of some interest that the late age of onset in scrapie has its counterpart in recessive muscular dystrophy in man. The interest to human geneticists is heightened for readers of this *Bulletin* because of certain similarities between scrapie and kuru, already reported (this *Bulletin*, 1960, v. 57, 76).] *A. C. Stevenson*

PARASITOLOGY: GENERAL

JEFFERY, G. M. **A Three-Year Epidemiologic Study of Intestinal Parasites in a Selected Group of Mental Patients.** *Amer. J. Hyg.* 1960, Jan., v. 71, No. 1, 1–8.

This records a painstaking research into the alimentary parasitization of a group of 110 inmates of a U.S. mental institution, which was maintained over a period of 3 years. During the survey faeces examinations were made on 9 separate occasions, at each of which 2 specimens from every patient were examined by a zinc sulphate flotation method: occasional egg counts were also carried out by the Stoll method.

The patients had previously been housed in an old building where standards of sanitation were inevitably low, but at the beginning of the 3-year observation period they were transferred to entirely new buildings where the sanitation was exemplary.

The intensity of intestinal parasitization may be judged from a table (Table 1) which gives the mean incidence of infection with each parasite in the group throughout the study period. A few significant figures may be abstracted to illustrate this:—hookworm 73%, *Entamoeba coli* 78%, *Endolimax nana* 48%, *E. histolytica* 12% and *Trichuris trichiura* 83%. A more striking observation, summarized in another table (Table 2), shows that, despite the provision of ample space and the best possible sanitary facilities, the incidence of parasitization of nearly every type increased steadily throughout the 3-year period of the survey. This was most marked in the case of *E. nana*, the incidence of which increased from 19·1 to 88·2%, while other important increases included that of *E. histolytica* (10·0–39·1%), *E. coli* (75·5–96·4%) and *Giardia intestinalis* (4·5–34·5%). Only *Chilomastix mesnili* and *Trichomonas hominis* showed a net decrease during the observation period. The 3 intestinal helminths, *Ancylostoma*, *Trichuris* and *Strongyloides*, showed no further dissemination after the transference of the group to their new quarters; this was attributable to the lessened use of the outdoor recreation areas, whose soil, being dry and sandy, was in any case less favourable for larval development. [Ascariasis had been eliminated from the population under study before their move to the new quarters.] *J. H. Walters*

KOZAR, Z. **The Problem of Parasitic Anthropozoonoses.** *Wiadomości Parazytologiczne.* Warsaw. 1959, v. 5, Nos. 2/3, 199–211. [Fuller version in Polish 175–98. (31 refs.)]

An attempt is made to classify the zoonoses of parasitic origin, in distinction to those in which the infective agent is a virus, spirochaete, fungus, bacillus, etc. The exact classification is the result of two main considerations:—the degree of adaptability of a host to a parasite, and the reverse of this, *i.e.* the physiological factors in the parasite which give it varying degrees of invasiveness. These processes are always changing, and can be altered by artificial (*i.e.* by injections of cortisone) or by natural means. A subsidiary factor is that both host and parasite populations are not homogeneous and it may well be that the selection and overproduction of a minor form may change the whole pattern of events. Illustrations are taken from many organisms, particularly *Trichinella* and *Toxoplasma*.

The parasites are placed into three groups, as follows:—

(1) Zooparasites
  (a) Absolute—highly specific to animals, and man completely insusceptible (the true zoonoses);
  (b) Relative—less specific to animals, and man occasionally susceptible to the larvae or even the mature forms (the relative anthropozoonoses).

(2) Anthropozooparasites
  The parasites show an equal or about equal specificity to man and animals (the anthropozoonoses proper).

(3) Anthropoparasites
  (a) Absolute—highly specific to man, and animals completely insusceptible;
  (b) Relative—less specific to man, and animals occasionally susceptible.

Most protozoans belong to 3 (b), though 6 species can be placed under 2. An equal number of flukes, tapeworms and nematodes belong to 1 (b); 15 species (nearly all flukes) can be assigned to 2; flukes form most of 3 (a).

The author concludes that although animal parasites may still provide, by an unpleasant mutation, a surprise for man, his hygiene techniques are likely to develop much more quickly than the slow processes of evolution.

[See also this *Bulletin*, 1958, v. 55, 1052.] *P. C. C. Garnham*

ENTOMOLOGY AND INSECTICIDES: GENERAL ZOOLOGY

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

STONE, A. *et al.*, **A Synoptic Catalog of the Mosquitoes of the World (Diptera, Culicidae).**

This book was reviewed on p. 546.

PARRISH, D. W. **The Mosquitoes of Turkey.** *Mosquito News.* 1959, Dec., v. 19, No. 4, 264–6, 1 fig.

This is a check list of 55 species of mosquito, including 13 species of *Anopheles*, collected during a survey of the mosquitoes of Turkey since 1958. Light traps were used in addition to other collecting methods, but there is no detailed information in this paper other than an indication for each species of the range over the 4 climatic areas described. *B. R. Laurence*

SENEVET, G., CLASTRIER, J. & ANDARELLI, L. Les moustiques du Tassili des Ajjer (V). [**The Mosquitoes of Tassili des Ajjer, Algeria**] *Arch. Inst. Pasteur d'Algérie.* 1959, Dec., v. 37, No. 4, 598–602, 1 fig.

Descriptions of *Anopheles rhodesiensis* sbsp. *rupicolus* and *Culex* (*Neoculex*) *arbieeni*.

BARRETO-REYES, P. Mosquitos de Colombia (Diptera, Culicidae). (1) Nuevos registros. **[Mosquitoes of Colombia (Diptera, Culicidae). New Registration]** *An. Soc. Biol. Bogotá.* 1957, Nov., v. 7, No. 5, 190–96.

The English summary appended to the paper is as follows:—

"The following hematophagous forest mosquitoes: *Mansonia hermanoi*, *Sabethes quasicyaneus*, *Psorophora champerico* and *Aedes leucotaeniatus* were collected in several localities of the municipality of San Vicente de Chucurí, Santander, Colombia, and its presence for the first time in the country, is recorded."

SAKAKIBARA, M. **On *Anopheles* (*Anopheles*) *omorii* n.sp.** *Endem. Dis. Bull. Nagasaki Univ.* 1959, Sept. 23, v. 1, No. 3, 288–95, 3 pls. [18 refs.]

COLLESS, D. H. **Notes on the Culicine Mosquitoes of Singapore. VI. Observations on Catches made with Baited and Unbaited Trap-nets.** *Ann. Trop. Med. & Parasit.* 1959, Sept., v. 53, No. 3, 251–8, 1 fig. **VII. Host Preferences in relation to the Transmission of Disease.** *Ibid.*, 259–67. [14 refs.]

VI. The trap-net used consisted of a large mosquito net, about 6 feet × 6 feet × 8 feet, with the door open, and one or two men present continuously collected mosquitoes entering and resting on its inner surface. This is a modified version of the trap familiar in Malayan work for years and which included human bait protected by a smaller net within the larger one. Tests were made of the efficiency of the trap. First, two traps were erected and compared in various ways, with and without continuous bait, collections being made from the inside and outside faces of the nets and catches also being made on human bait a little way from the traps.

Numerous species of mosquito are represented in the various evening and night catches, those in numbers adequate for analysis including *Culex tritaeniorhynchus*, *C. p. fatigans*, *C. gelidus*, *C. bitaeniorhynchus*, *Aëdes albopictus*, *Mansonia uniformis* and *Anopheles vagus*. Of interest is that about half the mosquitoes caught were taken in the unbaited trap-net. As many as, for example, 43% unfed *C. tritaeniorhynchus* and 37% unfed *C. fatigans* were in this trap, although the baited trap and a man outside each trap were fairly close by. Gravid females, fed females and males of these species, and some or all of these categories for other species, also occurred in substantial proportions in the unbaited trap and on its outside wall. The unbaited trap is, therefore, suggested as a means of capturing random samples of mosquito species in flight, including blood-fed specimens for precipitin tests. Escapes probably occurred during periods when collections were not being made from the unbaited trap, but unfed *C. gelidus* seemed to rest long enough to be collected periodically without material loss by escapes. Known man-biters—*Aëdes albopictus* and *M. uniformis*—and also *C. tritaeniorhynchus* and *C. fuscocephalus* were attracted towards human bait; the first two, but not the *Culex* species, then bit readily. When many cattle were nearby *C. tritaeniorhynchus* was notably deviated from man. *C. p. fatigans* was not strongly attracted towards man apparently, but bit readily once in proximity to the human host. *Culex gelidus* as a rule lacked interest in human bait, a general

field experience in Singapore. Several other differences in the distribution of the mosquitoes, female and male, between baited and unbaited traps are briefly noted although their biological significance is yet obscure.

The results show that catches in a baited trap of this kind cannot be interpreted as being due entirely to attraction to the bait. In general, feeding on a host involves, first, attraction to its vicinity and, secondly, the act of biting. With some species the second event may not take place at once, the mosquito first resting nearby for some time.

VII. The hosts of mosquitoes in Singapore were investigated by collections of gorged resting females, mainly outdoors in rural and semi-rural localities. Collections were made mainly by day and generally in low vegetation at ground level, but some data concern catches in unbaited trap-nets, human bait traps and the shelters of domestic animals and fowls, the last named sources at night. Precipitin tests were made by Mr. B. Weitz of the Lister Institute in London.

Due consideration is given to the effects of traps, baits and location on the validity of the findings as representative of the normal feeding tendencies of the mosquitoes. This type of work is of value in the elucidation of virus ecology on the island, particularly of Japanese B encephalitis.

In discussion, it is noted that *Aëdes albopictus*, *A. aegypti*, *Culex p. fatigans*, *Mansonia* and *Armigeres* bite man sufficiently regularly to act as vectors of pathogens from man to man, as is already known for dengue, *Wuchereria bancrofti* and *W. malayi* infection in Singapore. Species of *Mansonia* and *Armigeres* include, possibly, also birds and domestic animals (*Mansonia*) as hosts. Their potentialities, if susceptible to infection, for transmitting pathogens from non-human reservoirs are real. Zoonoses in cows and pigs would implicate *Culex tritaeniorhynchus* and *C. gelidus* as vectors between such hosts and across to man, at least when the preferred hosts were few or absent. Both species have been found naturally infected with Japanese B encephalitis in Malaya and the former in Singapore [*Bull. Hyg.*, 1957, v. 32, 835], and pigs are a potential reservoir in Singapore. Several other species of *Culex* seem likely to act only as vectors of infections between birds, but *C. pseudovishnui* and *C. sitiens* may, in addition, effect the link of transmission to man. About 5% feed on man. There is sufficient variety in host selection within some mosquito species and overlap of hosts selected by different species to suppose that a number of hosts and vectors form interlocking cycles effective in maintaining a virus infection on the island. *D. S. Bertram*

Moulinier, C. Allongement des stades et modifications de la viabilité de *Culex pipiens* par réfrigération expérimentale. [**Elongation of the Developmental Cycle and Modifications of Viability of *Culex pipiens* by Means of Artificial Refrigeration**] *C.R. Soc. Biol.* 1959, v. 153, Nos. 8/9, 1336–8.

Larvae and pupae of *Culex pipiens* were exposed to a temperature of 6°C., either continuously or for 24-hour periods, at different development stages. The results showed that development from hatching of the egg to emergence of the imago could be extended from a normal development time of 20–28 days to 55–58 days. Exposure of pupae to the lowered temperatures appeared to have the most marked lengthening effect on the developmental cycle.

E. R. Nye

LOOMIS, E. C. & SHERMAN, E. J. **Comparison of Artificial Shelters and Light Traps for Measurement of *Culex tarsalis* and *Anopheles freeborni* Populations.** *Mosquito News.* 1959, Dec., v. 19, No. 4, 232–7, 1 fig. [13 refs.]

Mosquitoes were trapped for two seasons in artificial resting places made out of 1-foot cube wooden box traps, painted red [this *Bulletin*, 1943, v. 40, 581], and placed in position on the ground in the shade, with the openings into the box away from the prevailing wind. Mosquitoes resting in the boxes were counted and identified by torch-light 1 to 5 times a week, and the numbers estimated in this way were also checked in the laboratory. The results of this trapping method are compared with the catches obtained in a light trap (American model) suspended 5 feet above the ground, and operated for 9 to 12 hours on 3 nights each week.

Approximately equal numbers of *Culex tarsalis* were captured by the box trap and by the light trap and both these methods recorded the same seasonal distribution of this species. Larger numbers of *Anopheles freeborni* were obtained in the box traps. The same pattern of seasonal change was recorded in each of 9 box traps. *B. R. Laurence*

CHAO, J. & WISTREICH, G. A. **Microbial Isolations from the Mid-Gut of *Culex tarsalis* Coquillett.** *J. Insect Pathol.* New York. 1959, Dec., v. 1, No. 4, 311–18. [23 refs.]

The midguts of about 24 female and male *Culex tarsalis* adults, bred as larvae in brewer's yeast medium, fed on emergence on apple slice for 2 days, then starved for about 24 hours, were isolated and examined by bacteriological culture methods. The method of surface sterilization of the insects (with 80% ethanol or hexylresorcinol) appears to have been effective, and also isolation of the midgut was obtained without contamination of other tissues.

Species of the following genera of organisms were isolated from midgut cultures: *Achromobacter*, *Aerobacter*, *Escherichia*, *Flavobacterium*, *Micrococcus*, *Proteus*, *Pseudomonas*, besides *Saccharomyces* and *Geotrichum* occasionally and unidentified Gram-negative rods.

Male mosquitoes showed fewer organisms than females, but the reason is uncertain.

[No comment is made on the relationship of this midgut content to the food provided for the larvae and the adults.] *D. S. Bertram*

HADDOW, A. J. **Studies on the Biting Habits and Medical Importance of East African Mosquitos in the Genus *Aëdes*. I. Subgenera *Aëdimorphus*, *Banksinella* and *Dunnius*.** *Bull. Entom. Res.* 1960, Jan., v. 50, Pt. 4, 759–79, 5 figs. [Numerous refs.]

The author discusses the results of bait collections, mostly from man, in Kenya and Uganda, of mosquitoes belonging to the subgenera of *Aëdes*, *Aëdimorphus*, *Banksinella* and *Dunnius*. In the subgenus *Aëdimorphus*, members of the *apicoannulatus*, *argenteopunctatus* and *domesticus* groups are found biting by day near the forest floor but a few females may visit the forest

canopy and bite at night. Females of the *A. tarsalis* group are also diurnal mosquitoes of the forest floor, which show a biphasic biting curve, although again most of the few specimens visiting the canopy were captured at night. Members of the *abnormalis* group showed similar behaviour but these species are also found in plantations. In the *dentatus* group of *Aëdimorphus*, *A. dentatus* bites mainly at dawn and sunset, but *A. cumminsi* in the forest shows a marked peak of biting activity during the hour before and the hour after sunset. However, in the plantations *A. cumminsi* was found to be mainly nocturnal and, also, most of the specimens captured in the tree canopy were captured at night.

In contrast to the other species of *Aëdimorphus*, *A. natronius* was found, not commonly, mostly in the tree canopy in the forest. On the tree platforms all the specimens were captured at night or just before sunset, whereas at ground level 5 out of 11 specimens were captured during the day.

In the subgenus *Banksinella*, *A. circumluteolus* is more commonly taken biting moving bait, but will also feed throughout the day and night at ground level in the forest on stationary bait. Most females (70%) bite during the day. However, out of 52 mosquitoes taken on tree platforms 65% were captured at night, and 12 out of 13 females captured in plantations were also collected at night. At ground level in the forest, *A. palpalis* was found to have the same behaviour as *A. circumluteolus*, and other species of *Banksinella* appear to have similar habits.

Only one species of the subgenus *Dunnius* was found, *A. albomarginatus*, and the biting cycle of this species at the forest floor was diurnal, with a peak of activity in the late afternoon.

The results of these collections are discussed with reference to the transmission of Semliki Forest virus, Ntaya virus, Bunyamwera virus, Rift Valley fever, yellow fever and Uganda S virus; all of these have been isolated from various pools of different species of mosquito collected (mainly) in Bwamba County and around Entebbe. Members of all 3 of the subgenera discussed here have been involved in these isolations of virus. Semliki Forest virus was first isolated from the *abnormalis* group of *Aëdimorphus*. Bunyamwera virus was isolated from a pool of *Aëdes* species, over half of which belonged to the subgenus *Banksinella*. Localized foci of this virus (3 to 4% immunity in man) were found close to the Semliki Forest and in the Ruwenzori foothills, but the incidence of immunity was higher (25%) in the open Semliki Plains. *A. circumluteolus* is abundant in the plains whereas the other species which made up the virus isolation pool are more or less confined to the forest. Other records are given, in a very valuable summary of the virus infections of *Aëdes* and other mosquitoes in Africa, of the isolation of 7 separate viruses and 1 variant from this species. Other members of *Banksinella* appear to be involved in transmission of virus and there have been 2 definite isolations of Rift Valley fever from the *tarsalis* group of *Aëdimorphus*.

There is also a useful summary of the collecting stations used by the author and his colleagues during this and previous work at Entebbe.

The term "Williams' mean", Mw, is proposed for the mean derived by summation of the logarithms of each biting catch plus 1, [$\log (Mw + 1) = \frac{\log (n + 1)}{N}$], referred to in previous papers as the "geometric mean" [this *Bulletin*, 1954, v. 51, 1110].

B. R. Laurence

BURGESS, L. **Techniques to give Better Hatches of the Eggs of *Aëdes aegypti* (L.) (Diptera: Culicidae).** *Mosquito News.* 1959, Dec., v. 19, No. 4, 256–9, 2 figs.

More eggs of *Aëdes aegypti* hatch in 1 hour in deoxygenated water, containing less than 2 p.p.m. of dissolved oxygen, than in water containing more oxygen. Eggs stored at 30–60% relative humidity and 0–10% RH took longer to hatch than eggs kept at 90–100% RH and the length of time to hatch increased with length of storage. Eggs stored at 30–60% RH decreased in viability with length of storage and some decrease in viability was also observed in eggs stored at 90–100% RH. [See also this *Bulletin*, 1956, v. 53, 253, 254.] *B. R. Laurence*

MELLANBY, K. **Acclimatization affecting the Position of the Cold and Heat Death Points of Larvae of *Aëdes aegypti* (L.).** *Bull. Entom. Res.* 1960, Jan., v. 50, Pt. 4, 821–3.

The author, commenting on a paper by BAR-ZEEV [this *Bulletin*, 1958, v. 55, 830], quotes experiments showing that acclimatization of larvae of *Aëdes aegypti* at temperatures of 20°C. and 18°C. for 24 hours resulted in very little mortality (7–8%) among the larvae then exposed to 0·5°C. for 17 hours, whereas larvae kept at 30°C. all died when exposed to 0·5°C. for 17 hours. At 5°C. larvae acclimatized to 18°C. survived for a longer period than did those kept previously at 30°C.

Earlier work [*ibid.*, 1954, v. 51, 844] had shown that larvae acclimatized to higher temperatures also had a higher thermal death point.

Acclimatization is rapid and is also reversible, but the physiological mechanism is not known; neither, as the author points out, is the cause of death at high and low temperatures. *B. R. Laurence*

NAKATA, G. [**The Effect of Sodium Chloride present in the Medium on the Oviposition and Viability of *Aëdes aegypti* Linn**] *Botyu-Kagaku.* Kyoto. 1957, v. 22, No. 1, 74–80, 2 graphs. [11 refs.] [In Japanese.] English summary.

"It is concluded that the highest concentration of sodium chloride in which *A. aegypti* can complete its development lies between 0·75 and 1 per cent."

GALUN, Rachel. **Respiration of Decapitated Mosquitoes.** [Correspondence.] *Nature.* 1960, Feb. 6, v. 185, 391–2.

Decapitation of *Aëdes aegypti* was studied as a means of obtaining inactive insects in which fluctuations in oxygen uptake would be minimized and studies on their basal metabolism more readily pursued. Restriction of flight activity by removing halteres was another approach, but haltereless mosquitoes had remarkably (and unexplained) low oxygen uptakes.

At 12°C. and 28°C., both the normal and decapitated mosquitoes had similar uptakes (0·96 compared with 1·84 and 13·1 compared with 14·7 mm.^{3}/

hour/mosquito, as measured by a Warburg apparatus) when inactive, the oxygen intake being rather higher in decapitated than in normal *Aëdes*, the opposite effect of this operation on silkworm and *Musca*. Such levels persisted for 4–5 hours after decapitation. A blood meal 24 hours before decapitation was associated with a much higher oxygen uptake than for decapitated mosquitoes previously fed on sugar and water, or water only. The uptake rates for the last two groups were similar. The respiratory quotient was always between 0·9 and 1·1. Decapitation did not disturb the rhythm of spiracle opening and closing, but they opened wider and failed to close completely. Respiration and oxygen uptake may be controlled partly from the head, but apparently not by the corpora allata. With lowered oxygen tensions, uptake is maintained in both intact and decapitated *Aëdes* by the spiracles opening wider, for longer, and more frequently. *D. S. Bertram*

McClelland, G. A. H. **Observations on the Mosquito,** *Aëdes* (*Stegomyia*) *aegypti* **(L.), in East Africa. II. The Biting Cycle in a Domestic Population on the Kenya Coast.** *Bull. Entom. Res.* 1960, Jan., v. 50, Pt. 4, 687–96, 1 fig. [26 refs.]

Outdoor populations of *Aëdes aegypti* from Uganda show a sharply defined rhythm of biting and general activity [this *Bulletin*, 1960, v. 57, 82]. At Ganda, 5 kilometres inland from Malindi, on the Kenya coast, 24-hour catches in huts or hut compounds showed the same biting activity indoors and out-of-doors, with 2 peaks in activity in the first and fifth hours after sunrise, followed by an increase in activity in the late afternoon to a peak of biting activity in the hour before sunset. The presence of males at the bait showed peaks of activity at approximately the same times as the biting females, but the maximum activity was before sunrise instead of before sunset.

Of 427 females collected while biting, 82·1% belonged to the variety *queenslandensis*, 14·5% were of the type form, and 0·9% belonged to the subspecies *formosus*. Two forms of the variety *queenslandensis* could be distinguished, one with silver and the other with matt white scales forming lateral spots on the abdominal tergites. [The author has drawn the attention of the abstracter to an error; the numbers of the two forms of the variety *queenslandensis* given in Table I are transposed, only a minority having white lateral spots.]

The author concludes that maximum biting activity is always found from 1–2 hours before to just after sunset, and that where subsidiary peaks of activity are found these occur in a series of waves of increasing intensity until the maximum is reached. He also suggests that activity impulses may occur in a cycle of waves of increasing intensity which may be expressed in full in a favourable environment, but which may be delayed or suppressed if microclimatic conditions are outside the threshold limits of activity.

B. R. Laurence

See also p. 583, Surtees, **The Breeding Behaviour of the Type Form of** *Aëdes* (*Stegomyia*) *aegypti* **(L.) in South-Western Nigeria in relation to Insecticidal Control.**

FONTAN, R. & FAURAN, P. Apparition en Guyane Française d'une souche d'*Aëdes aegypti* résistant au D.D.T. [**Appearance of a Strain of *Aëdes aegypti* Resistant to DDT in French Guiana**] *Arch. Inst. Pasteur de la Guyane Française et de l'Inini. Publication No. 455.* 1959, Mar., 8 pp., 2 figs. [11 refs.]

[See this *Bulletin*, 1959, v. 56, 124.]

KLEIN, J. M. & MICHEL, R. Observations sur le niveau de sensibilité aux insecticides des larves de l'*Aedes* (*Ochlerotatus*) *detritus* (Haliday), 1833 du littoral méditerranéen. [**Observations on Susceptibility to Insecticides of *Aëdes* (*Ochlerotatus*) *detritus* Larvae from the Mediterranean Coast**] *Bull. Soc. Path. Exot.* 1959, May–June, v. 52, No. 3, 295–9.

The susceptibility of third and fourth stage larvae of *Aëdes* (*Ochlerotatus*) *detritus* to DDT, dieldrin and BHC was measured. Larvae were collected from two locations in the Hérault region of southern France. The larval test method recommended by WHO was employed. After the 24-hour intoxication period the surviving larvae were transferred to clean water for a further 24 hours. All tests were carried out at 20°C. in water which had been obtained from the breeding sites and filtered through cotton. This water was reddish yellow in colour and rich in organic matter with a high NaCl content (14–35 gm./litre).

The results are based on the mortalities recorded during the second 24-hour observation period. DDT was found to be an average of 30 times less effective than dieldrin or BHC. This comparative inefficiency of DDT is attributed, in part, to the ability of the larvae to recover after being placed in clean water. The authors suggest, therefore, that the interaction between DDT and the organic matter or the ions of water should be investigated. [See HAWKINS and KEARNS, *Bull. Entom. Res.*, 1956, v. 47, 197; this *Bulletin*, 1956, v. 53 (1399).]

Reference is made to an earlier study on *Aëdes caspius* and other mosquitoes [HAMON *et al.*, this *Bulletin*, 1960, v. 57, 423]. Compared with *A. detritus*, the larvae of *A. caspius* were considerably more sensitive to DDT but both species were equally susceptible to dieldrin. *B. C. Fine*

FEHN, C. F., CARMICHAEL, G. T., ELMORE, C. M., Jr. & TAYLOR, J. W. **Operational Experiences with Paris Green Pellets in Mosquito Control.** *Mosquito News.* 1959, Dec., v. 19, No. 4, 238–43, 1 fig. [10 refs.]

Paris green pellets were made by drying a mixture of No. 3 vermiculite mixed with 10% Triton N-101, 30% water and 60% 40W motor oil as a sticker, and 90% Paris green (copper acetoarsenite). The pellets weigh about 16 pounds per cubic foot and are distributed by hand in the breeding places at 4 pounds per acre. Machine operated distributors did not distribute the pellets evenly, or were slow, whereas one man could treat an acre of ground in 30 minutes. The pellets could be distributed more evenly than sprays or dusts and penetrate also more readily through vegetational cover. *B. R. Laurence*

VARGAS, L. & DIAZ NÁJERA, A. Claves gráficas para identificar géneros y subgéneros de larvas, pupas y adultos de simúlidos (Diptera: Simuliidae). [**Keys for the Identification of Genera and Subgenera of Larvae, Pupae and Adults of** *Simulium*] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1959, Mar., v. 19, No. 1, 105–14, 8 pls.

LEWIS, D. J. & GARNHAM, P. C. C. **The Simuliidae (Diptera) of British Honduras.** *Bull. Entom. Res.* 1960, Jan., v. 50, Pt. 4, 703–10, 1 fig. [19 refs.]

Two man-biting species of *Simulium*, *S. quadrivittatum* and *S. metallicum*, are nuisances in British Honduras but although *S. metallicum* is a known vector of onchocerciasis, this disease appears never to have been established in the country, although known from western Guatemala. *S. callidum*, but not *S. ochraceum*, and 10 other species of *Simulium* are also recorded. Of these, only 2, "*S. samboni*?" and *S. veracruzanum*, are recorded as biting man. Notes are given on the species found, including notes on dissections of *S. metallicum*, and there is also a map showing the localities mentioned and the distribution of onchocerciasis in Mexico and Guatemala. *B. R. Laurence*

ABONNENC, E. Sur *Phlebotomus schwetzi* Adler, Theodor et Parrot, 1929. [**Notes on** *Phlebotomus schwetzi*] *Arch. Inst. Pasteur d'Algérie.* 1959, Dec., v. 37, No. 4, 591–3, 1 fig.

ABONNENC, E., ADAM, J. P. & BAILLY-CHOUMARA, Hélène. Sur trois phlébotomes cavernicoles nouveaux de la région éthiopienne: *P. crypticola*, *P. balmicola* et *P. somaliensis*. [**Three New Cave-Dwelling Species of** *Phlebotomus* **from the Ethiopian Region:** *P. crypticola*, *P. balmicola* **and** *P. somaliensis*] *Arch. Inst. Pasteur d'Algérie.* 1959, Dec., v. 37, No. 4, 577–90, 10 figs.

VARGAS, L. & DÍAZ NÁJERA, A. *Phlebotomus farilli* n. sp., *Ph. humboldti* n. sp. y *Ph. olmecus* n. sp. de México (Diptera, Psychodidae). [*Phlebotomus farilli* **n.sp.,** *P. humboldti* **n.sp. and** *P. olmecus* **n.sp. in Mexico**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1959, June, v. 19, No. 2, 141–59, 43 figs. on 6 pls. English summary (6 lines).

LAURENCE, B. R. **Oviposition by** *Mansonioides* **Mosquitoes in the Gambia, West Africa.** *Proc. Roy. Entom. Soc. of London.* Ser. A. 1959, Dec. 31, v. 34, Pts. 10/12, 161–70, 4 figs. [22 refs.]

In studies on oviposition by *Mansonia africanus* and *M. uniformis* in the Gambia it was found that egg masses were laid mainly on the underside of the leaves of *Nymphaea micrantha* and to a lesser extent on *Nymphaea lotus*, *Marsilea*, *Heteranthera callifolia* and the floating leaves of the grasses *Echinochloa* sp. and *Oryza* sp. *Pistia* is uncommon in the Gambia. Leaves floating in open water were not used for oviposition and the presence of

emergent vegetation, near the edges of pools, appeared necessary for an area to be acceptable to an ovipositing mosquito and was a more important factor than the leaf shape, size or species. It was also found that egg masses were rare on leaves more than 12 cm. across. No change in oviposition rate was found over a period of 14 days in a small area. Clearance of rice swamps reduced breeding area by reducing the number of floating leaves available for oviposition. *E. R. Nye*

Fain, A., Magis, P., Verdin, G., Donkers, J. & Göbbels, P. Sur deux cas de myiases humaines produites par *Chrysomyia bezziana* Villeneuve, au Congo belge. [**Two cases of Myiasis in Man caused by** *Chrysomyia bezziana* **in the Belgian Congo**] *Ann. Soc. Belge de Méd. Trop.* 1959, Oct. 31, v. 39, No. 5, 763–5.

Ovazza, M., Rickenbach, A. & Valade, M. Tabanides de la région de Bobo-Dioulasso (Haute-Volta). Répartition et rythme annuel; quelques notes de systématique. [**Tabanids of the Bobo-Dioulasso Area, Upper Volta. Distribution and Seasonal Rhythm**] *Bull. Soc. Path. Exot.* 1959, Sept.–Oct., v. 52, No. 5, 679–98, 1 map on folding pl.

This paper gives a very clear account of the habitat ranges and seasonal distributions of 35 species and 2 varieties of African Tabanidae, including 2 species of *Chrysops*, around Bobo-Dioulasso in French West Africa. The genera *Hippocentrum* and *Haematopota* were found to be limited generally to the rainy season, June to October, whereas a number of species in the genera *Ancala*, *Atylotus* and *Tabanus* were found to have a longer flight season. Some species, however, such as *T. ovazzai* and *T. sticticollis*, were found as adults only during the dry season. *Chrysops distinctipennis* occurred throughout the area from June to November and was also captured during the dry season in March. *C. longicornis* was rare.

Haematopota lacessens is recorded as a nuisance biting man, and 8 other species of tabanid were also taken on man.

Notes are also given on the taxonomy of certain species. *Atylotus fuscipes* is believed to be a synonym of *A. albipalpus* and *Hæmatopota hamoni* a synonym of *H. pinguicornis*. *H. pseudogracilis* is a subspecies of *H. gracilis*. *B. R. Laurence*

Otsuru, M. & Ogawa, S. **Observations on the Bite of the Tabanid Larva in Paddy-Fields (Diptera, Tabanidae).** *Acta Med. et Biologica.* Niigata. 1959, July, v. 7, No. 1, 37–50, 16 figs. on 4 pls. [30 refs.]

"Worms" living in the mud of paddy fields in the Hokuriku district of Japan, and capable of very painful punctures of the hands and feet of workers in the rice fields, have proved to be tabanid larvae. The majority of bites are inflicted on the fingers and ankles. In most cases a pale flat wheal developed at the bite and erythema appeared after 2 to 3 minutes, becoming most conspicuous after about 20 minutes, with a diameter of 10 to 75 mm. The erythema and swelling disappeared usually within 24 hours but, in some

cases, symptoms persisted for 7 days. Local paraesthesia distally, possibly due to the injection of saliva, was also recorded.

Larvae from the rice fields were kept in mud, which was renewed at intervals, and fed on live earthworms. By this method 6 species of *Tabanus* and 2 of *Chrysops* were reared to adult, and 4 species of *Tabanus* and 1 of *Chrysops* were shown to be capable of biting as larvae.

The use of BHC, DDT and diazinon, sprayed in various combinations over the rice fields in April and May is recommended as a possible control measure for this form of " paddy-field dermatitis ". *B. R. Laurence*

Beer, J. R., Cook, E. F. & Schwab, R. G. **The Ectoparasites of some Mammals from the Chiricahua Mountains, Arizona.** *J. Parasitology.* 1959, Dec., v. 45, No. 6, 605–13. [11 refs.]

A survey of ectoparasites of small mammals was made from the Chiricahua Mountains, Arizona. 834 animals were examined and 16 species of fleas, 2 species of biting lice and 11 species of sucking lice were collected. Data are given on specific host preference, which was found to be more rigid for the lice than the fleas. *E. R. Nye*

Serdyukova, G. V. **On the Question of Differential Characteristics of Larvae and Nymphs of Ixodidae** *Zool. Zhurnal.* 1955, v. 34, No. 5, 1037–51. [19 refs.] [In Russian.] [Translation 18, Dept. Med. Zool., U.S. Nav. Med. Res. Unit No. 3, Cairo.]

In this paper the author, by studying the immature stages of ixodid ticks of the U.S.S.R., has devised a key for the generic differentiation of larvae and nymphs. The majority of larvae and nymphs studied were obtained from single correctly identified females of 5 species each of *Ixodes* and *Haemaphysalis*, 1 species of *Boophilus*, 4 species each of *Dermacentor* and *Rhipicephalus* and 5 species of *Hyalomma*. In addition, immature stages of *Ceratixodes putus, Dermacentor silvarum* and *Haemaphysalis concinna* collected in nature were also examined.

Most of the paper deals with a critical appraisal of the significance and value of various characters used in the diagnosis of immature stages. The presence and position of the anal groove is a useful character, although it must be remembered that in the larvae of some genera the anal groove may not be completely developed or not developed at all. The presence of fovea, which are paired discs found on the dorsum, serves to distinguish nymphs and adults of the subfamily Amblyomminae from those of the Ixodinae. Additional characters which the author discusses are: the form of the anal opening and the number of setae surrounding it; the presence of festoons, although this character is difficult to see in larvae and nymphs, particularly when they are engorged; the development and shape of the eyes; and the coxal armature.

The eyeless *Haemaphysalis*, festoonless *Boophilus* and *Hyalomma* with its large, hemispherical, orbital eyes can be separated without too much difficulty. The larvae and nymphs of *Dermacentor* and *Rhipicephalus* can be separated by the shape of the palpi, which are cylindrical and blunt in *Dermacentor* and triangular and sharp in *Rhipicephalus*. The presence of auriculae

distinguishes the larvae and nymphs of *Dermacentor* from those of *Hyalomma*; auriculae are absent in larvae of *Rhipicephalus* although nymphs possess them. The number of palpal segments is also a useful character: larvae of *Rhipicephalus* have 2, those of *Dermacentor* 3; nymphs of *Rhipicephalus* have 3 palpal segments while nymphs of *Dermacentor* have 4.

Keys are given to the larvae and nymphs of *Ceratixodes*, *Ixodes*, *Boophilus*, *Haemaphysalis*, *Dermacentor*, *Rhipicephalus* and *Hyalomma*.

[The original Russian text is illustrated with 20 figures. The reproduction of these in the translation would have added to the usefulness of the paper.]

M. G. R. Varma

DICKERSON, G. & LAVOIPIERRE, M. M. J. **Studies on the Methods of feeding of Blood-Sucking Arthropods. II. The Method of feeding adopted by the Bed-Bug (*Cimex lectularius*) when obtaining a Blood-Meal from the Mammalian Host.** *Ann. Trop. Med. & Parasit.* 1959, Sept., v. 53, No. 3, 347–57, 5 figs. [12 refs.]

As in a previous paper on triatomine bugs [this *Bulletin*, 1960, v. 57, 19] the mechanism of feeding by *Cimex lectularius* was observed directly under the microscope in bugs feeding from the ear of mice and rats. Some histological preparations of the mammal ear were also examined, and with bug mouthparts *in situ*. Within the 4-segmented labium lie the two outwardly convex maxillae which, closely apposed, form the food canal and, in virtue of the apposition of their grooved posterior edges, form also a separate salivary canal. The left maxilla broadens distally to a spear-like tip; the right tapers to J-shape. The two slender mandibles are closely applied to the outer curvatures of the maxillae and have fine teeth at their tips. In bed bugs, the two mandibles and two maxillae (the fascicle) keep together as the insect probes deep to find capillaries. In triatomines, the mandibles penetrate only superficially, the maxillae alone extending to the blood vessels. The labium, in both kinds of bug, buckles back from the skin surface. Haemorrhages are produced by the probing fascicle of *Cimex*, but it feeds usually from a capillary. The fascicle shows considerable flexibility as it probes about in the skin. Probably only the right maxilla actually enters a capillary, the other three elements remaining on the outer surface of the capillary. No salivary ejection was detectable by the technique used.

The authors comment that histological evidence of haemorrhages caused by biting is not sufficient to prove that an insect is a pool-feeder. Direct observation of the kind used in this work and by earlier workers on this subject is essential to determine whether pool- or capillary-feeding takes place [see also this *Bulletin*, 1949, v. 46, 514].

D. S. Bertram

HOLSTEIN, M. H. Résistance à la dieldrine chez *Cimex hemipterus* Fab. au Dahomey, Afrique Occidentale. [**Resistance of *Cimex hemipterus* to Dieldrin in Dahomey, West Africa**] *Bull. Soc. Path. Exot.* 1959, Sept.–Oct., v. 52, No. 5, 664–8. [10 refs.]

In the course of measures to control *Anopheles gambiae*, the village of Ketonou some 12 km. from Porto-Novo, the capital of Dahomey, was sprayed

with DDT from 1953 to 1955 and with dieldrin annually from 1956 to late September 1958. In January and February 1959 a great increase in numbers of *Cimex hemipterus* was noted.

Tests of susceptibility were made on lots of 30 to 40 adult bugs in Petri dishes with WHO test papers. In preliminary experiments, exposure was made for 1 hour to concentrations of dieldrin from 0·05 to 4% and the mortality rate was recorded after 24 hours. As a result of these trials it was decided to use papers impregnated with 4% dieldrin in Risella oil; tests were also made with 4% pure dieldrin crystals in powdered talc placed directly in the Petri dishes. Exposures were made at 2-hour intervals up to a maximum of 12 hours. In the case of the pure crystals, mortality in 24 hours after a 12-hour exposure was 90·6%. With the test papers for the same periods, mortality was only 23%.

Control tests were therefore made on bugs in an area some 40 km. outside the periphery of the pilot zone, in concentrations of dieldrin from 0·05 to 4%. The exposure was for 1 hour and it was found that the mortality with 0·8% dieldrin was 100%. Thus 77% of bugs in the treated area survived exposure to 4·0% dieldrin for 12 hours, although the LD50 for the same species in an adjoining untreated area was 0·08%.

The author refers briefly to records of resistance of *C. hemipterus* to insecticides, especially its resistance to dieldrin, with reference to the findings of HAMON *et al.* in the Upper Volta region [this *Bulletin*, 1958, v. 55, 1077] and of SMITH [*ibid.*, 1959, v. 56, 588] in the Pare region of Tanganyika.

H. J. O'D. Burke-Gaffney

HUNTER, Wanda S. & HIGGINS, R. P. **An Unusual Case of Human Porocephaliasis.** [Research Notes.] *J. Parasitology*. 1960, Feb., v. 46, No. 1, 68, 1 fig.

A Negro boy of 16 from Danville, Virginia, noticed a white spot in the anterior chamber of the eye, which caused no pain. This proved to be a parasite floating free in the anterior chamber and on removal it was identified as an unencapsulated third stage larval pentastomid *Linguatula serrata*. The source of the parasite was not determined. There was no history of close association with domestic animals or of swimming. Piped water was used in the boy's home but it is stated that he "does enjoy fishing". Examinations for other parasites elsewhere in the body were all negative. There are drawings of the ventral and lateral aspects of the parasite.

H. J. O'D. Burke-Gaffney

EDMUNDS, L. R. & BLAKESLEE, T. E. **Intensive Limited Area Control of Potential Arthropod Disease Vectors.** *J. Econom. Entom.* 1959, Dec., v. 52, No. 6, 1050–53, 1 fig.

The authors preface this paper with a statement suggesting that arthropod disease vectors may be used in any future war. In view of this and the need during military operations for entering an area and achieving quick control of insects, a study was conducted at a military installation in Virginia, U.S.A.

The natural insect and mite populations in a 40-acre experimental area and a 20-acre control area were determined before the application of insecticides, during the treatment period and after treatment had stopped. The effect of the insecticides on an introduced population of the house-fly (*Musca domestica*) was also studied.

10% DDT in the form of spray, dust and fog and 2·7% malathion fog were dispersed in the treatment area for a period of 10 days. The total amount of insecticides applied amounted to 18·74 pounds per acre. During the treatment period, there was a 90% reduction in the mosquitoes collected from light traps and an 81% reduction in the biting collection; however, after insecticide applications had stopped, there was an increase in the population. A 76% reduction of the mite population and a 94% reduction of the general insect population obtained during treatment was maintained even after treatment had stopped.

Control of the introduced fly population was more difficult to obtain. The authors end the paper by emphasizing the need for quick detection and control if, during enemy action, large numbers of insecticide-resistant arthropods infected with disease agents are released in a limited area. — *M. G. R. Varma*

SOPER, F. L. **Introduction of DDT to Italy, 1943–1945.** *Riv. di Parassit.* Rome. 1959, Dec., v. 20, No. 4, 403–9.

MŁODECKI, H. Poglądy na mechanizm działania nowoczesnych środków owadobójczych. [**Opinions on the Mechanism of Action of the Modern Insecticides**] *Roczniki Państwowego Zakładu Hig.* Warsaw. 1959, v. 10, No. 3, 289–303. [21 refs.]

BLÁZQUEZ, J. **The Residual Insecticidal Effect of Bayer Compound S-1752 (Bayer 29 493) in Laboratory Tests.** *J. Econom. Entom.* 1959, Dec., v. 52, No. 6, 1096–9.

REPORTS AND SURVEYS

ACQUAH, Ioné [M.Sc. (Econ)]. **Accra Survey. A Social Survey of the Capital of Ghana, formerly called the Gold Coast, undertaken for the West African Institute of Social and Economic Research, 1953–1956.** 176 pp., illustrated. 1958. London: University of London Press Ltd., Warwick Square, E.C.4.

This survey includes chapters on history, population, residence, economic life, government, education, health and welfare, religion, and recreation. It contains large numbers of facts, but the text is lively and interesting.

The chapter on health and welfare gives a list of traditional healers—herbalists (the majority), midwives, medicine men, Muslim healers, fetish priests and priestesses, and soothsayers. There is an association of herbalists

which aims at raising the quality and status of these practitioners, whose lore is much like that of herbalists in other countries. They rely on traditional knowledge handed down, but some of them have magico-religious cures. The traditional midwives have picked up their knowledge from others in a system of apprenticeship, and again some of them practise magico-religious treatment.

Medicine men possess what is regarded as a powerful medicine or *ju-ju*, acquired from others after certain rites have been performed. Muslim healers have undergone years of instruction, and are versed in the use of herbs; their prayers are important. Fetish priests attribute sickness to the breaking of ethical rules of the Tigare cult, and only confession before a priest, at a shrine, can restore health. Some fetish priests are believed to have become possessed by a god or spirit. Soothsayers claim to foretell the future.

There are, of course, the 3 general and 3 special hospitals in Accra in which western medicine is practised to a high degree of competence. Arrangements are being made for a medical faculty to be established in the University College, and eventually Ghana will train its own doctors. The author gives a detailed account of these hospitals, and other medical institutions, and of the public health services. Infant mortality is declining (106 in 1949, 90 in 1953) and smallpox, yellow fever, typhoid and plague are under control. Housing and overcrowding are still problems.

This is an excellent account of the position. It is important that the beliefs about the nature and causation of disease, and the underlying assumptions of those who practise traditional methods of healing, should be understood by doctors and administrators. *Charles Wilcocks*

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Competition is invited for the first award in 1961 of the Patrick Buxton Memorial Prize, endowed by his relatives in memory of Patrick Alfred Buxton, C.M.G., F.R.S., Director of the Department of Entomology at the London School of Hygiene and Tropical Medicine since 1926 and Professor from 1933 until his death in 1955.

Candidates shall be past or present students of the School or members of the School staff. A Board, to be appointed by the School, shall select the candidate who, in its opinion, submits the best essay relating to medical or veterinary entomology or an allied subject based on published or unpublished research by the candidate.

The Prize shall be £150.

Essays should reach the Dean, London School of Hygiene and Tropical Medicine, Keppel Street (Gower Street), London, W.C.1, not later than March 31, 1961.

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